Instruction Manual

FLUKE

ELECTRONICS FOR INDUSTRY
INSTRUMENTS / COMPONENTS

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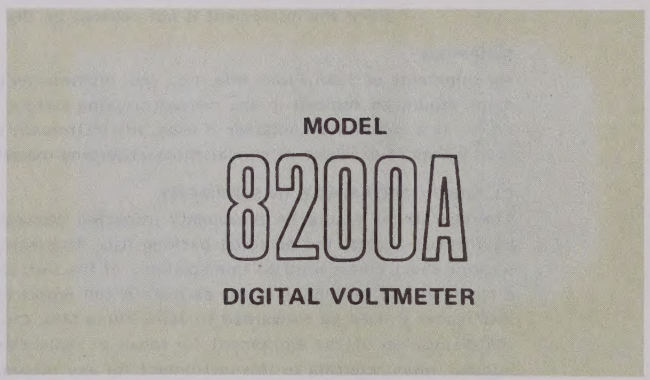

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MODEL 8200A DIGITAL VOLTMETER

Section 1
Introduction & Specifications

1-1. DESCRIPTION

1-2. The Model 8200A Digital Voltmeter (DVM) is a versatile instrument with four full decades of digits plus a fifth digit for 60% overrange. Its mainframe accepts a family of analog and system options that may be installed in the field at any time, in any sequence, for expansion from a bench DVM into a full systems multimeter capable of 400 readings per second.

1-3. Fluke's Recirculating-Remainder* Analog to Digital (A to D) conversion technique is used in the 8200A. This conversion circuitry periodically samples the input and serially digitizes the sample, providing a reliable DVM with high long-term accuracy and linearity plus superior environmental characteristics.

1-4. Basic DVM

1-5. The basic instrument measures dc voltages on four ranges with 100 microvolt resolution and 60% overranging. Standard features are switched filter, all-pushbutton selection and display, and thousand volt guarding. The digitized voltage is displayed on an in-line neon tube readout which includes polarity, overrange digit, and four full digit decades. Illuminated indicators designate the function called.

1-6. Optional analog and isolated digital plug-in circuit boards may be installed in the basic DVM at the factory or afield.

1-7. Analog Options

1-8. The Millivolt option provides two measurement ranges of 10 and 100 millivolts displayed on five digits. This permits resolving 1 microvolt on the 10 millivolt range and 10 microvolts on the 100 millivolt range. Up to 400 switched readings per second may be taken on the 100 millivolt range and 10 readings per second on the 10 MV range. Autoranging between millivolt and dc ranges is standard, with automatic MV to VDC function changeover and display. The switched filter may be used with the millivolt option.

1-9. AC voltage from 30 Hz to 100 kHz are measured on the four ranges of the AC option. Millivolt level ac voltages can be measured even though they are superimposed on a kilovolt of dc.

1-10. Up to 16 megohms of resistance can be measured using the Resistance option. Resolution at the low end is 10 milliohms. Full autoranging and Ω/KΩ/MΩ autofunctioning permit completely automatic measurement over the 10 milliohm to 16 megohm spectrum.

1-11. True four terminal, real-time ratio determinations may be obtained with the External Reference option. Four DC/DC ratio ranges are available when it is used with the basic 8200A. When Millivolts and AC Volts options are installed, MV/DC and AC/DC ratios can be measured.

1-12. Digital Options

1-13. The Printer Output option provides isolated and buffered data transfer for data logging systems. Grounded printers may be used without compromising any 8200A common mode specifications. Output is DTL/TTL compatible 8-4-2-1 BCD for parallel acquisition. The 8200A may be triggered up to 400 times a second via this option.

* *Patent Pending*

1-14. Isolated Data Output and Isolated Remote Control options make the 8200A a true systems DVM. They both operate with DTL/TTL levels, but Remote Control can also be exerted via contact closures. Each use guarded toroids for transfer of data from and to the 8200A. Both options are designed for multiplexing of remote control and data output on sets of lines common to a number of 8200A's.

1-15. Data may be acquired serially by character in multiples of four bits or completely in parallel. Automatic delays of data transfer can be single-line programmed to allow for settling time of the analog input prior to digitizing the data transferred. A speed of 400 readings per second is a further feature of the Data Output option.

1-16. Control commands can be applied to the Remote Control Unit and then removed, but the commanded functions and ranges will be retained in memory. Interlock logic prevents calling (selecting) incompatible functions or dual ranges simultaneously.

1-17. Accessories

1-18. A number of accessories are available for the 8200A including rack mounting kits, high voltage probes, and a high frequency probe. These accessories are listed at the rear of this section. All options and accessories are described fully in Section 6 of the manual.

1-19. Outline Drawing

1-20. The Model 8200A Outline Drawing is shown in Figure 1-1.

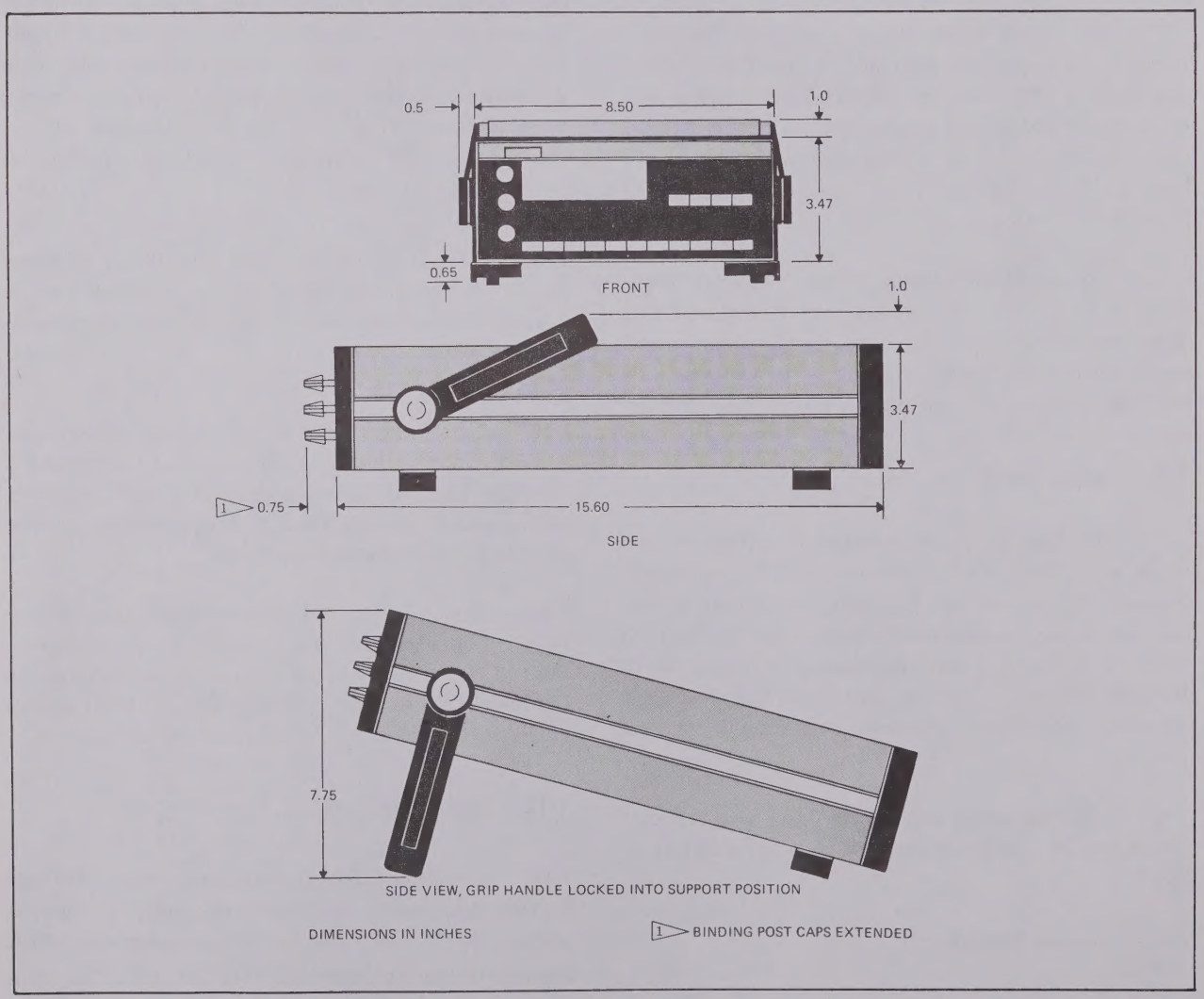


Figure 1-1. MODEL 8200A OUTLINE DRAWING

1-21. SPECIFICATIONS

1-22. DC Volts

RANGES	±1V, ±10V, ±100V, ±1000V (automatic polarity selection)
Resolution	±0.01% of range, (±100 uV, maximum)
Overrange	60%, ±1200V maximum input on ±1000V range
Overload	±1200V DC or 1100V RMS (±1500V peak) may be continuously applied to any range without damage.
ACCURACY (To 160% of range or ±1200V maximum input)	
90 days, 18°C to 28°C	±(0.01% of input + 0.01% of range)
1 year, 18°C to 28°C	±(0.02% of input + 0.03% of range)
Temperature Coefficient	
−10°C to 18°C and 28°C to 50°C	±(0.001% of input + 0.001% of range)/°C
Input Impedance, ±1V range	10,000 megohms, minimum shunted by less than 130 p.f.
±10V to ±1000V ranges	10 megohms ±0.2%
Offset Current	Less than 50 pa
NOISE REJECTION	
Normal Mode, Filter "in"	Greater than 60 db @ 50 Hz increasing to greater than 65 db @ 60 Hz and 100 db @ 200 Hz and above.
Common Mode (with up to 1K unbalance in either lead)	
DC Only, Filter "in" or "out"	Greater than 140 db
DC to 60 Hz, Filter "in"	Greater than 140 db
Filter "out"	Greater than 110 db or ±1 digit (whichever is greater)

NOTE: Common Mode Rejection specifications are maintained with any combination of options installed and are unchanged with the use of grounded devices with the remote control, data output or printer output options.

RESPONSE TIME (To a reading within 0.01% of range when measuring step inputs and using external trigger.)

Filter "out"	2.5 milliseconds
Filter "in"	Less than 500 milliseconds

1-23. General

A/D Conversion Technique	Recirculating–Remainder
Digitizing Time	2.5 milliseconds
Sample Aperture	500 microseconds (at A/D converter input)
Sample Rate, External Trigger*	400 readings per second maximum for all functions
Internal Trigger	4 readings per second, basic DVM
Autorange Time (Per range change)	
External Trigger*	25 milliseconds: MV/VDC and Ω/KΩ/MΩ, Filter "out" 250 milliseconds all other combinations
Internal Trigger	250 milliseconds

* *NOTE: External triggering is accomplished via Data Output or Printer Output Options.*

Filters	4 pole active filter for DC volts, and resistance measurements, 3 pole active filter for millivolt measurements.
Range Selection	Manual, Automatic standard, Remote optional.
Function Selection	Manual standard, Remote optional, Autorange MVDC/VDC, Ω/KΩ/MΩ
Function Annunciator	Lamp indicator for each function selected.

Display	In-line, neon-tube display of polarity, overrange digit and 4 full decades of digits with automatic decimal placement.
Overload Limits (Maximum voltage that may be continuously applied without damage)	
"Hi" to "Lo"	See individual functions under "range", "Overload".
"Lo" to "Guard"	±100V DC or peak AC.

NOTE: A protection circuit causes a warning lamp to illuminate when this limit is exceeded.

"Guard" to "Chassis"	±1000V DC or peak AC, maximum common mode voltage for any function.
Temperature Range, Operating	−10°C to 50°C
Non-operating	−40°C to +75°C
Humidity Range, 0°C to 25°C	Less than 80% relative humidity
25°C to 50°C	Less than 70% relative humidity
Altitude Range, Operating	To 10,000 feet (3.048 km)
Non-operating	To 50,000 feet (15.24 km)
Shock and Vibration	Meets requirements of MIL-T-21200H and MIL-E-16400F
Operating Power	115/230V ±10%, 50 to 440 Hz, less than 25W
Weight	Less than 15 pounds (7, 8 kg) with all options
Size	3–1/2" H x 8–1/2" W x 15" D (88 mm x 216 mm x 381 mm)
Warm-up Time	20 minutes to 1 year accuracy, 1 hour to full accuracy.

1-24. OPTIONS

1-25. AC Volts (Using Option 8200A-01 AC Converter Unit)

RANGES	1V, 10V, 100V, 1000V
Resolution	±0.01% of range. 100 uv on 1V range maximum
Overrange	60%, 1100V rms maximum
Overload	1100V rms may be continuously applied to any range without damage.
Superimposed DC	±1100 VDC (Peak ac plus dc may not exceed ±1500V)

ACCURACY (To 160% of range or 100V maximum input)

90 days, 18°C to 28°C

0.001V to 500V

50 Hz - 20 KHz	±(0.1% of input +0.02% of range)
20 KHz - 50 KHz	±(0.2% of input +0.02% of range)
30 Hz - 50 Hz and 50 KHz - 100 KHz	±(0.5% of input +0.02% of range) *

500 V to 1100V

50 Hz - 20 KHz	±0.15% of input
20 KHz - 50 KHz	±0.2% of input*
30 Hz - 50 Hz	±0.5% of input

**NOTE: Input volt x hertz product should not exceed 2×10^7.*

Temperature Coefficient	
0° to 18°C and 28° to 50°C	±(0.002% of input +0.001% of range)/°C
Input Impedance	1.11 megohm, ±0.2%, shunted by less than 130 pf

NOISE REJECTION

Common Mode (With up to 100Ω unbalance in either lead)	
DC to 60 Hz	Greater than 120 db

RESPONSE TIME . . . . . Less than 500 milliseconds to a reading within 0.1% of range when measuring step inputs and using external trigger.

1-26. DC Millivolts (Using Option 8200A-02 MV Converter Unit)

RANGES . . . . . ±10 MV ±100 MV with automatic polarity selection.

NOTE: Model 8200A autoranges between millivolts and dc volts.

Resolution . . . . . ±0.01% of range, ±1 uv maximum
Overrange 60%
Overload (to either range)
Fifteen seconds . . . . . ±1200V dc or 1100V rms may be applied without damage.
Continuous . . . . . ±300 V dc or rms may be applied without damage.

ACCURACY (To 160% of range)

90 days ±100 MV range . . . . . 0.01% of input +0.01% of range)
(18°C to 28°C) ±10 MV range . . . . . 0.01% of input +0.02% of range)

Temperature Coefficient, −10°C to 18°C and 28°C to 50°C (Not using zero control)
±100 MV range . . . . . ±(0.0015% of input +0.002% of range/°C
±10 MV range . . . . . 0.02% of range/°C
Input Resistance . . . . . 10,000 megohms minimum both range
Zero Stability, 90 days . . . . . Less than 10 uv, not using zero control
Offset Current . . . . . Less than ±10 pa.

NOISE REJECTION

Normal Mode ±10 MV range . . . . . Greater than 75 db @ 50 Hz and greater than 80 db @ 60 Hz

Filtered ±100 MV range . . . . . Greater than 55 db @ 50 Hz and greater than 60 db @ 60 Hz

Common Mode (with up to 1K unbalance in either lead)
Filter "in," DC to 60 Hz . . . . . Greater than 180 db
Filter "out," DC . . . . . Greater than 180 db
DC to 60 Hz
10MV range . . . . . Greater than 140 db
100 MV range . . . . . Greater than 130 db

NOTE: With Filter out maximum "LO" to "GUARD" unbalance is 1Ω.

RESPONSE TIME (To a reading within 0.01% of range when measuring step inputs and using external trigger.)

Filter "out", ±100 MV range . . . . . 2.5 milliseconds
±10 MV range . . . . . Less than 100 milliseconds
Filter "in", ±10 MV & ±100 MV ranges . . . Less than 2 seconds

1-27. Resistance (Using Option 8200A-03 Ohms Converter Unit)

RANGES 100Ω, 1KΩ, 10KΩ, 100KΩ, 1000KΩ, 10MΩ

NOTE: Model 8200A will autorange through all resistance ranges.

Resolution . . . . . 0.01% of range, 10 milliohms maximum
Overrange . . . . . 60% on all ranges, 16 megohms maximum
Overload
100Ω . . . . . 30V rms (fused)
1KΩ – 10MΩ . . . . . 130V rms maximum (overloads in excess of 130V, to 1000V, cannot damage any active circuits)

ACCURACY (To 160% of range)

90 days (18°C to 28°C)	1KΩ–100KΩ ranges	±(0.01% of input +0.01% of range)
	1000KΩ range	±(0.02% of input +0.02% of range)
	100Ω range	±(0.03% of input +0.02% of range)
	10MΩ range	±(0.1% of input +0.02% of range)

Temperature Coefficient (–10°C to 18°C and 28°C to 50°C)

100Ω – 100KΩ ranges	±(0.001% of input +0.001% of range)/°C
1000KΩ ranges	±(0.005% of input +0.002% of range)/°C
10MΩrange	±(0.015% of input +0.01% of range)/°C

CONFIGURATION	Two terminal
Current through R measured	0.1 μa @ 10MΩ increasing in decade steps to 10 ma @ 100Ω
Maximum voltage across R measured	1.6 Volts at 160% of range
Open terminal voltage	+10V maximum

RESPONSE TIME (To a reading within 0.01% of range when measuring step inputs and using external trigger)

100Ω - 100KΩ ranges	Filter "out"	2.5 milliseconds
	Filter "in"	500 milliseconds (550 milliseconds on 100KΩ range)
1000K range	Filter "out"	4.5 milliseconds
	Filter "in"	1.2 seconds
10M range	Filter "out"	30 milliseconds
	Filter "in"	7 seconds

1-28. Isolated External Reference

(Four Terminal DC/DC Ratio using Options 8200A-04 External Reference Input Unit and 8200A-05 Parallel Rear Input Unit.)

REFERENCE INPUT

Range of Reference Voltage	+1V to +11V
Reference Input Resistance	1 megohm ±0.1%
Isolation of Reference and Input commons	Reference voltage plus commons difference voltage must not exceed ±25V
RANGES	±0.1;1, ±1.0:1, ±10:1, ±100:1

NOTE: When the Millivolts Option (8200A-02) is installed the ratio capability of the 8200A is extended to include Ranges of ±0.001:1 and ±0.01:1 with full Autoranging from the ±0.001:1RANGEthrough to the ±100:1 1 RANGE.

Resolution	±0.01% of ratio, ±0.00001:1 maximum
Overrange	60%, ±1200V or 1100V rms maximum input on the ± 100:1 range.
Overload	±1200V dc or 1100V rms (±1500 Peak) ac may be continuously applied to any range without damage.
Reading vs Ratio	10 x ratio

ACCURACY

90 days at 18°C to 28°C	±(0.01% of input +0.01% x $10V/V_{ref}$ of range)
Temperature Coefficient	Same as DC Volts multiplied by $10V/V_{ref}$

NOISE REJECTION (At Reference Input)

Normal Mode	25 db @ 60 Hz
Common Mode (With up to 1k unbalance)	80 db with +10V reference

REFERENCE SETTLING TIME	1 second maximum to 0.01% of ratio range for a step change of reference voltage.

1-29. Isolated Printer Output (Option 8200A-06) Printer Output Unit (P.O.U.)

Data Available	Digits, polarity, range
Coding	8421 BCD digits and range
Logic levels	1 = +5V, 0 = 0V (Series 930 DTL with 6k pull up)
Maximum Trigger Rate	400 per second

1-30. Isolated Data Output (Option 8200A-07) Data Output Unit (D.O.U.)

Data Available	Digits, polarity, range, functions
Coding	8421 BCD, digits and range
Logic levels	1 = +5V, 0 = 0V (Series 930 DTL with 6k pull up)
Maximum Trigger Rate	400 per second
Flags	Ready, overload
Acquisition	Full parallel or serial by character in multiples of 4 bits
Timeouts	Automatic delays to allow for settling time of analog inputs are enabled using a single control line.

NOTE: Options 8200A-06 and 8200A-07 are mutually exclusive and cannot be installed simultaneously.

1-31. Isolated Remote Control (Option 8200A-08) Remote Control Unit (R.C.U.)

Control levels	0 = function called, 1 = function inactive
Logic levels	0 = contact closure or 0V, 1 = open or +5V
Input Definition	Series 930 DTL
Control Command Storage	Continuous or addressed remote control of instrument. Triggered address control allows the 8200A to "latch" to input commands. Following latch, the commands may be removed but the functions and ranges commanded will continue to be in effect until the next address trigger.
Interlocks	Incompatible functions or simultaneous ranges cannot be called.
No Call	Volts dc and autorange called
Flag	+5V, when the Remote button is depressed.

1-32. Rear Input (Option 8200A-05) (Five-pin connector rear input in parallel with front input)

	BASIC 8200A & Options	ACCESSORIES
8200A	Four Range DC DVM	A90 AC/DC Current Shunts
8200A-01	AC Converter	80F-5, H-V Probe
8200A-02	MV Converter	80F-15, H-V Probe
8200A-03	Ohms Converter	80 RF, RF Probe
8200A-04	External Reference	M03-200-607 (Off Set Rack Mount)
8200A-05	Parallel Rear Input	M03-200-606 (Side-By-Side Rack Mount)
8200A-06	Printer Output	M03-200-608 (Center Mount Rack Mount)
8200A-07	Data Output	Extender Board
8200A-08	Remote Control	

NOTE: Order options for field installation by adding K to option number as 8200A-01 K.

Section 2
Operating Instructions

2-1. INTRODUCTION

2-2. This section contains operating instructions for the Model 8200A Digital Voltmeter. If any problem is encountered in operating the instrument, contact the nearest John Fluke Sales Representative or write directly to the John Fluke Mfg. Co., Inc. Please include the instrument serial number when writing.

2-3. INSTALLATION

2-4. The 8200A is supplied with non-marring feet and tilt-down bail for bench or field use. Rack mounting kits for installation of the instrument in a standard 19-inch rack are available. These accessories are described in Section 6.

CAUTION!

Dirt or fingerprints on switches or printed circuit boards will degrade the performance of this instrument. Handle PCB's by their edges or wear clean cotton gloves.

2-5. REPACKAGING FOR SHIPMENT

2-6. If reshipment is required, use the original container or request a new container from the John Fluke Mfg. Co., Inc. Please include instrument model number with your request.

2-7. OPTIONS AND ACCESSORIES

2-8. Model 8200A options and accessories are listed in Table 2-1. They are fully described in Section 6.

Table 2-1. OPTIONS AND ACCESSORIES

OPTION NO.	NAME OF UNIT
8200A–01	AC Converter
8200A–02	MV Converter
8200A–03	Ohms Converter
8200A–04	** External Reference Input
8200A–05	Parallel Rear Input
8200A–06	* Printer Output
8200A–07	* Data Output
8200A–08	Remote Control

** 8200A–05 required with 8200A–04

* 8200A–06 and 8200A–07 may not be installed in an instrument simultaneously.

ACCESSORY NO.	NAME
292029	PCB Extender Assembly (Required for servicing pcb's)
M03-203-601	Offset Rack Mount
M03-200-603	Side-by-Side Rack Mount
80F-5	High Voltage Probe (5kV)
80F-15	High Voltage Probe (15 kV)
80RF	High Frequency Probe

2-9. INPUT POWER REQUIREMENTS

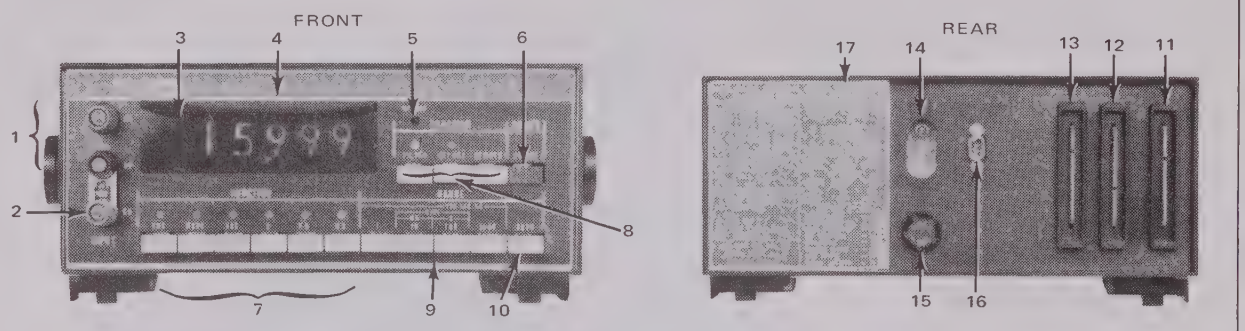
2-10. The 8200A operates on 115 or 230 volt, 50 Hz to 440 Hz, ac power. Before applying power to the instrument, note the position of the 115/230 volt slide switch on the transformer switch bracket at the rear of the instrument. This switch is accessible after removing the top dust cover. If the switch does not indicate the desired operating voltage, place it in the correct position.

WARNING!

Ensure that the instrument is connected to a high quality earth ground through the polarized line plug.

2-11. OPERATING FEATURES

2-12. The name and function of front and rear panel controls, terminals and indicators are shown in Figure 2-1.



REF. NO.	NAME	FUNCTION
1	INPUT Terminals	HI, LO input connections for dc voltage, ac voltage, and resistance measurements
2	GD (guard) Terminal	Connects to internal guard chassis. When properly connected externally, provides maximum common mode rejection.
3	Polarity Indicator	Automatic indication of input polarity for dc voltage: "+" for positive input voltage and "—" for negative input voltages.
4	Readout Tubes	Display DVM readout from left to right, with overrange digit displayed in left-most tube. All tubes except overrange indicator display a decimal point, depending on range. Full overrange readout on each range would appear as follows: RANGE — READOUT 1 — 1.5999 10 — 15.999 100 — 159.99 1000 — 1599.9
5	MV ZERO Control (MV Converter Option only)	Adjusted for a readout of 0.000 ±1 digit with MVDC, FILTER, and 10 range called and INPUT terminals shorted with a low-thermal shorting link.
6	POWER Switch	Controls instrument input power.
7,8	FUNCTION Switches	Select desired DVM operating mode. Associated indicator lights indicate active function. VDC — Places DVM in dc voltage mode with full scale ranges of 1, 10, 100 and 1000. If no range is called, DVM will autorange and autofunction between MVDC and VDC. MVDC — Places DVM in dc millivolts mode with full scale ranges of 10 and 100. If unavailable range or no range is called, DVM will autorange and autofunction between MVDC and VDC.

Figure 2-1. CONTROLS, TERMINALS AND INDICATORS

(Continued on following page)

REF. NO.	NAME	FUNCTION
		VAC — Places DVM in ac voltage mode with full scale ranges of 1, 10, 100 and 1000. Ω — Places DVM in ohms mode with full scale range of 100. If unavailable range or no range is called, DVM will autorange and autofunction between Ω, KΩ and MΩ. KΩ — Places DVM in kilohms mode with full scale ranges of 1, 10, 100 and 1000. If no range is called, DVM will autorange and autofunction between Ω, KΩ and MΩ. MΩ — Places DVM in megohms mode with a full scale range of 10. If unavailable range or no range is called, DVM will autorange and autofunction between Ω, KΩ and MΩ. FILTER — Controls 4-pole active input filter to provide noise rejection. Functional for dc volts, dc millivolts (3-pole only for millivolts) and resistance measurements. EXT REF — Enables substitution of isolated external reference voltage for DVM internal reference voltage. REMOTE — Places DVM in remote mode, enabling DVM function and range to be controlled remotely via optional Remote Control Unit.
9	Manual RANGE Switches	Permit manual selection of DVM range. Unselected range or incorrect range selection automatically places DVM in autorange mode.
10	AUTO RANGE Switch	Places DVM in autorange mode, providing automatic ranging for each function and its range complement.
11	Data Output Connector (No. 2)	Provides connections for Data Output Unit (Option 8200A–07).
12	Data Output Connector (No. 1) or Printer Output Connector	Provides connections for Data Output Unit (Option 8200A–07) or Printer Output Unit (Option 8200A–06).
13	Remote Control Connector	Provides connections for Remote Control Unit (Option 8200A–08).
14	AC Line Voltage Connector	Mates with polarized 3-wire power cord for connection to 115/230 volt, 50 Hz to 440 Hz, ac line.
15	Line Fuse	Protects DVM from overloads. Fuse rating is AGC 1/2A. Same fuse is used for 115V/230V operation.
16	Rear Input Connector	REAR ANALOG CONNECTION — Rear Analog Connector provides connections for External Reference Input and Parallel Rear Input (Options 8200A–04 and –05).
17	115/230 Volt Switch	Selects either 115V or 230V operation. Located on transformer bracket at rear of instrument: accessible after removing top dust cover.

Figures 2-1. CONTROLS, TERMINALS AND INDICATORS

2-13. MEASUREMENT INSTRUCTIONS

2-14. Measurement instructions for dc volts, dc millivolts, ac volts, and ohms are given in Table 2-2. The basic 8200A includes only dc volts capability. Millivolts, ac volts, and ohms measurement capability is provided via MV Converter, AC Converter, and Ohms Converter options, respectively. Installation, theory of operation, and maintenance instructions for these options are covered in Section 6.

Table 2-2. 8200A MEASUREMENT INSTRUCTIONS

MEASUREMENT	FUNCTION	RANGE	INPUT CONNECTIONS	REMARKS
± DC Volts	VDC	1, 10, 100, 1000	Front panel HI, LO terminals or rear input terminals if equipped with Parallel Rear Input option. Connect GD (guard) terminal as recommended in paragraph 2-63. Guarded Measurements.	DVM autoranges automatically if range is not manually selected or if selected range is not available. (Example: 1 MVDC) DVM autofunctions between MVDC and VDC and between Ω, KΩ and MΩ if unavailable range is selected. (Example: 1000 MΩ) 60% overrange is standard for all functions.
± DC Millivolts (Option)	MVDC	10, 100		
AC VOLTS (Option)	VAC	1, 10, 100 1000		
Ohms (Option)	Ω	100		
Kilohms (Option)	KΩ	1, 10, 100, 1000		
Megohms (Option)	MΩ	10		
MV Zero Adjustment (For MV Option)	MVDC, FILTER	10	Short INPUT terminals together with low-thermal shorting link.	Adjust front panel MV ZERO control for readout of 0.000 ±1 digit.

2-15. EXTERNAL REFERENCE

2-16. General

2-17. The External Reference Unit option enables substitution of an external dc voltage for the internal DVM reference voltage. The principal use of the instrument when operated in this manner is for voltage ratio measurements. Another important use is to allow substitution of a system voltage for the 8200A reference voltage, whereby variables in systems measurements may be reduced.

2-18. The External Reference Unit enables 4-terminal voltage ratio measurements: ±dc to dc, ±mV to dc, and ac to dc. A rear panel input connector is provided for reference voltage input. The connector is shown in Figure 2-2.

2-19. Operation

2-20. The following steps describe the basic operating procedure for ratio measurements:

a. Select the 8200A voltage range as desired according to the ratio range and corresponding readout shown in Table 2-3.

b. Connect reference voltage to rear input terminals.

c. Press EXT REF switch on front panel.

d. Press VDC or MVDC switch if dc/mV to dc voltage ratios are to be measured or VAC switch if ac to dc ratios are to be measured.

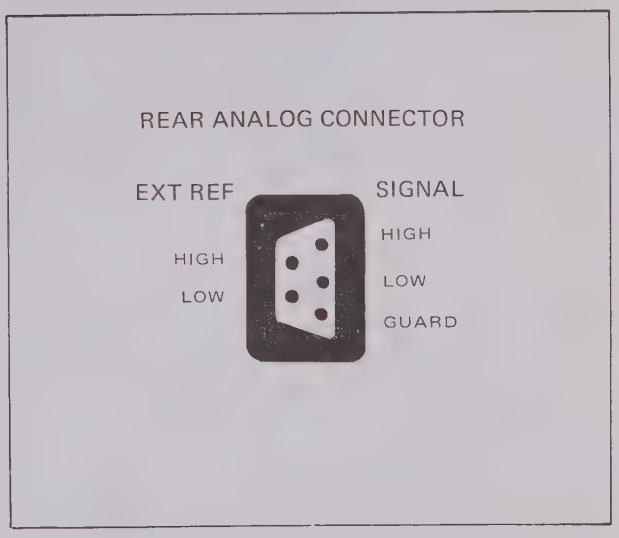


Figure 2-2. REAR CONNECTOR

2-21. Installation, theory of operation, and maintenance instructions for External Reference Unit are covered in Section 6.

Table 2-3. EXTERNAL REFERENCE RATIO RANGES

MODE	DVM RANGE	RATIO RANGE $\left(\frac{V_{INPUT}}{V_{REF}}\right)$	READOUT	REFERENCE INPUT
DC/DC X 10	1	0 to ±0.15999	0 to ±1.5999	+2V to +11V into 1 MΩ Input Resistance
	10	0 to ±1.5999	0 to ±15.999	
	100	0 to ±15.999	0 to ±159.99	
	1000	0 to ±159.99	0 to ±1599.9 *	
MV/DC X 10	10	0 to ±1.5999	0 to ±15.999	
	100	0 to ±15.999	0 to ±159.99	
AC/DC X 10	1	0 to 0.15999	0 to 1.5999	
	10	0 to 1.5999	0 to 15.999	
	100	0 to 15.999	0 to 159.99	
	1000	0 to 159.99	0 to 1599.9 *	

* Maximum input voltage is ±1200V dc or 1100V rms.

2-22. REMOTE CONTROL UNIT (RCU)

2-23. General

2-24. The Remote Control Unit (RCU) enables the 8200A to be programmed or controlled remotely. RCU inputs are designed to interface directly with DTL/TTL logic. Control by discrete transistors or contact switches is also possible. Operating power for the RCU must be supplied from an external +5 volt source having a current capability of at least 105 milliamperes. Power may be obtained from the Data Output or Printer Output options if the DVM is so equipped.

NOTE!

A +5V power supply is available for the RCU. Contact factory for further information.

2-25. The RCU provides the capability of controlling all DVM functions and ranges, and interlocking logic provided so that incompatible functions or dual ranges cannot be called simultaneously. Acceptable combinations are shown in Table 2-4.

2-26. Command Triggering

2-27. The RCU has two operating modes which control entry of external commands into the unit: continuous command mode and triggered command mode.

2-28. In continuous command mode, the RCU requires no external triggering. It always reflects present state of command inputs. To achieve this mode of operation, hold pins 25 and 27 on the remote control connector open or at Logic "1" (+5V).

2-29. In triggered command mode, the RCU only responds to programming inputs after application of an external trigger. It memorizes input commands within 10 microseconds of trigger application. Following the storage operation, programming inputs may be changed or removed without affecting stored information. To achieve this mode of operation, hold pin 27 (Auto Command Entry Defeat) low by application of Logic "0" or contact closure and apply the external trigger to pin 25 (External Command Entry). Trigger requirements (External Command Entry) are given in Figure 2-3. RCU connector location is shown as item 13 in Figure 2-1. Pin assignments are given in Table 2-5.

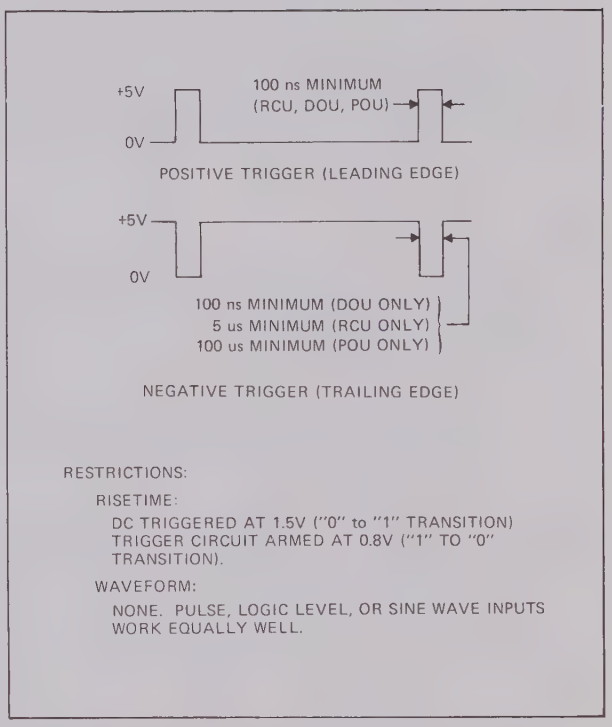


Figure 2-3. TRIGGER REQUIREMENTS

Table 2-4. REMOTE CONTROL UNIT LOGIC INTERLOCKING

FUNCTION	RANGE					FILTER	RATIO
	1	10	100	1000	NONE		
VDC	1	10	100	1000	AUTO	YES	YES
MVDC	100	10	100	10	AUTO	YES	YES
VAC	1	10	100	1000	AUTO	NO	YES
Ω	100	100	100	100	100	YES	YES
KΩ	1	10	100	1000	AUTO	YES	YES
MΩ	10	10	10	10	10	YES	YES

If function and range are not called , DVM goes to VDC mode and autoranges (providing REMOTE button is pressed and power is supplied to the RCU circuitry outside the guard).

If unavailable range or no range is called , DVM autoranges and autofunctions between MVDC and VDC and between Ω, KΩ and MΩ.

Remote Flag output is present when REMOTE button is pressed.

2-30. Remote Flag

2-31. A Remote Flag output is provided at pin 29 of the RCU input connector. This pin is "True" (+5V) when the REMOTE button is pressed.

2-32. Operation

2-33. To place DVM in remote operation, proceed as follows: See Figure 2-4 for RCU pin connections.

a. Connect external +5V dc power to pin 4 (+5V) and pin 2 (common).

b. Press FUNCTION REMOTE switch to transfer control of DVM function and range to remote control point.

c. Command a function or range via contact closure or zero volt logic level between appropriate pin and common. For example, to program 10 KΩ, filtered operation, command pins 13, 1 and 26 via contact closure or zero volts to pin 2 (common).

d. Sample rate may be increased from 4 readings per second (basic reading rate) to a maximum of 400 readings per second, with a minimum autorange time of 20 milliseconds per range change, when the DVM is triggered via the Data Output Unit or Printer Output Unit options.

2-34. Installation, theory of operation, and maintenance instructions for the Remote Control Unit are covered in Section 6.

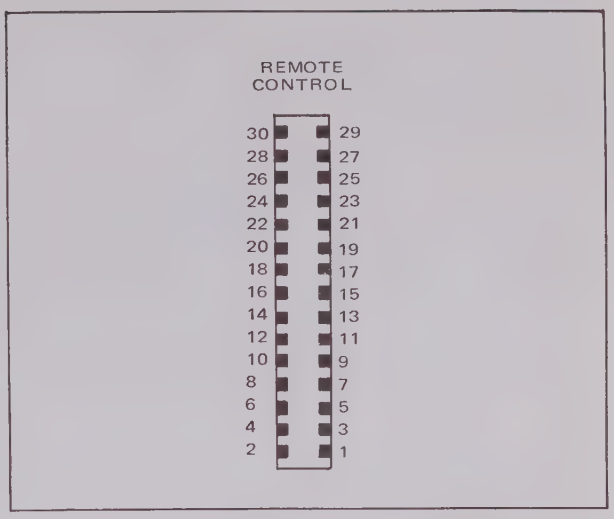


Figure 2-4. RCU REAR PANEL CONNECTOR

Table 2-5. REMOTE CONTROL UNIT PIN ASSIGNMENT

FUNCTION	PIN NO.	FUNCTION	PIN NO.
$\overline{\text{10 Range}}$	1	$\overline{\text{MΩ}}$	15
Common	2	$\overline{\text{MVDC}}$	17
$\overline{\text{1 Range}}$	3	$\overline{\text{VDC}}$	19
+5 Volt Input	4	$\overline{\text{External Reference}}$	21
$\overline{\text{100 Range}}$	5	External Command Entry	25
$\overline{\text{1000 Range}}$	7	$\overline{\text{Filter}}$	26
$\overline{\text{VAC}}$	9	Auto Command Entry Defeat	27
$\overline{\Omega}$	11	Remote Flag	29
$\overline{\text{KΩ}}$	13		

Spare Pins: 6, 8, 10, 12, 14, 16, 18, 20, 22, 23, 24, 28, 30.

NOTE: *1. +5V Input:* *Minimum current requirement = 105 milliamperes.*

2. Logic Levels: *Logic "0" = Contact closure or OV*
Logic "1" = +5V or open.

2-35. DATA OUTPUT UNIT (DOU)

2-36. General

2-37. DOU access is by means of two-edge card connectors located at the rear of the instrument. See item 12 in Figure 2-1. DOU pin connections are shown in Figure 2-5. Data may be acquired fully in parallel BCD format or serially by character in multiples of four bits. The Timeouts Enabled line activates automatic time delays that allow for full settling of analog input circuitry prior to data transfer.

2-38. The DOU is self-powered and provides +5V output for operation of the Remote Control Unit (Option –08) plus an additional 500 milliamperes for operation of other logic circuitry. DOU truth tables and logic levels are given in Table 2-6. Functional pin connections for the DOU are given in Table 2-7.

2-39. Control Signals

2-40. DOU control inputs consist of External Trigger, Autotriggering, and Timeouts Enabled. The External Trigger may be a positive or negative going signal as shown in Figure 2-3. Autotriggering is disabled by a Logic "0" and enabled by a Logic "1". The Timeouts Enabled input must be a Logic "1" to defeat the timeout period and a Logic "0" for normal operation with preprogrammed timeouts.

2-41. Automatic Timeouts

2-42. The response of the 8200A Data Output Unit to a data request consists of a function-dependent series of delays. When the Timeouts Enabled line is activated, a programmed one-shot circuit in the DOU automatically sequences the dalay series to provide data within specified accuracy in the minimum possible time. If fast settling times are possible for a specific application, the timeouts can be defeated, allowing sample rates as high as 400 per second. Application of +5V logic level or open circuit to pin 13 defeats the timeouts; application of Logic "0" or contact closure to pin 13 enables the timeouts.

2-43. The timing diagram for in-range inputs is shown in Figure 2-6. When programmed timeout operation is selected the programmed one-shot establishes Automatic Delay time T3 to T4. Automatic Timeout delay times are listed in Table 2-8.

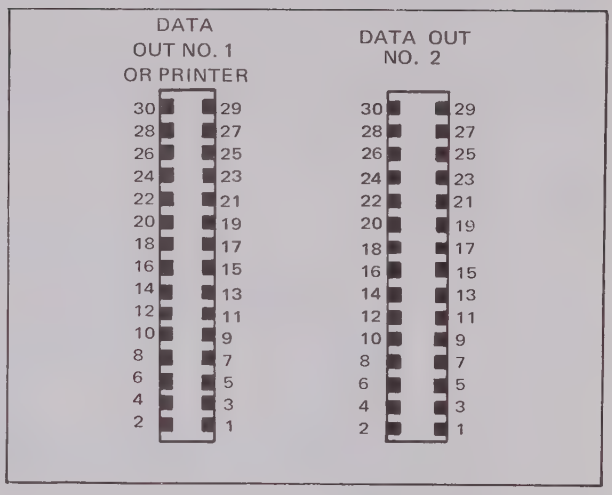


Figure 2-5. DOU/POU REAR PANEL CONNECTORS

Table 2-6. DATA OUTPUT UNIT TRUTH TABLES AND LOGIC LEVELS

OUTPUTS	LINES	OUTPUT LOGIC LEVELS	
		0 to +0.5V	+5V
Function VDC, MVDC, VAC, FILTER, Ω, KΩ, MΩ, EXT REF	8	Function inactive	Function operative at last sample
4 Digits, Binary-Coded Decimal 8-4-2-1	16	Logic 0	Logic 1
Polarity "+" = 0 "–" = 1	1		
Range (coded)	2		
Overrange Digit	1		
Flags Overload Ready	2	No Overload Ready	Overload Not Ready
+5V and Common	5	--	--

RANGE	LINE a	LINE b
1000	1	1
100	1	0
10	0	1
1	0	0

INPUTS	LINES	INPUT LOGIC LEVELS	
		0 to +0.5V	+5V
External Trigger	1	Inhibit	Enable
External Trigger Inhibit	1	Inhibit	Enable
Timeouts Enabled	1	Programmed timeouts (Normal)	Timeouts defeated (Fast)
Output Buffer Gate Control (Inhibit Lines)	8	Inhibit	Enable

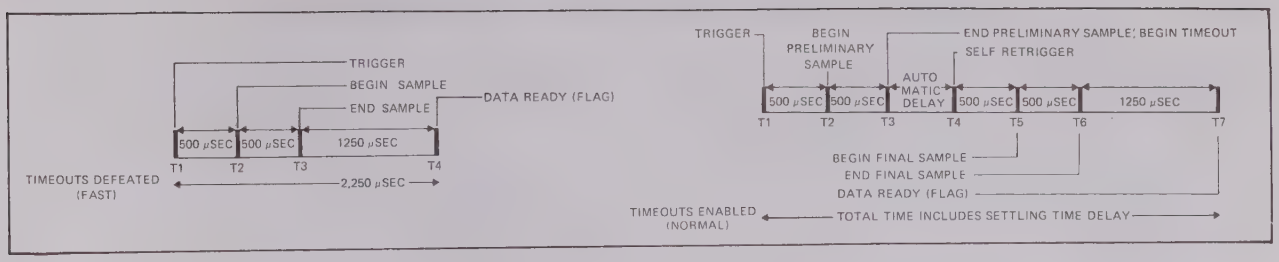


Figure 2-6. DOU TIMING DIAGRAM FOR IN-RANGE DVM INPUTS

Table 2-7. DATA OUTPUT UNIT FUNCTIONAL PIN CONNECTIONS

DATA	DATA OUT NO. 1	DATA OUT NO. 2	REMARKS
Function, Range and Polarity	PINS		Apply Logic "0" to gates to inhibit outputs.
VDC		6	
MVDC		8	
VAC		9	
FILTER		11	Function outputs Logic "1" when true.
Gate 2		2	
Ω		1	
KΩ		5	
MΩ		7	
Overload		3	
Gate 1		4	
Polarity	1		
Range b	3		
Range a	5		
EXT REF	6		
Gate 3	2		
Overrange "1"		10	- - -
Gate 4		15	
Ready Flag		17	- - -
Control Inputs			
Timeouts Enabled		13	Enabled if connected to ground.
Ext Trigger		19	
Autotriggering		20	Autotriggering disabled if connected to ground.

DATA	DATA OUT NO. 1	DATA OUT NO. 2	REMARKS
1st Decade (MSD)	PINS		Logic "0" = OV Logic "1" = +5V
1a		10	
1b		9	
1c		7	
1d		8	Apply Logic "0" to gates to inhibit outputs.
Gate 5		4	
2nd Decade			
2a		18	Bit Weight Code
2b		17	a = 8
2c		15	b = 4
2d		16	c = 2
Gate 6		13	d = 1
3rd Decade			
3a		24	
3b		23	
3c		21	
3d		22	
Gate 7		19	
4th Decade			
4a		30	
4b		29	
4c		27	
4d		28	
Gate 8		25	
+5V dc		29	+5V power for operation of RCU with 500 milli-ampere reserve.
Common		24	
		26	
		28	
		30	

Table 2-8. AUTOMATIC TIMEOUT VALUES FOR READY FLAG

FUNCTION/RANGE CALLED	TOTAL TIMEOUT (MEASURED AT READY FLAG OUTPUT – ALL TIMES ±10%)	FUNCTION/RANGE CALLED	TOTAL TIMEOUT (MEASURED AT READY FLAG OUTPUT– ALL TIMES ± 10%
VDC without Filter 1, 10, 100, 1000	15 msec	KΩ without Filter 1, 10, 100, 1000	17 msec
VDC with Filter 1, 10, 100, 1000	530 msec	KΩ with Filter 1, 10, 100, 1000	1.3 sec
MVDC without Filter 10, 100	120 msec	10 MΩ without Filter	45 msec
MVDC with Filter 10, 100	2.1 sec	10 MΩ with Filter	7.4 sec
VAC 1, 10, 100, 1000	850 msec	RANGE CHANGES – ADD TO TIMEOUTS	
Ω without Filter 100	17 msec	VDC, MVDC, Ω, KΩ, MΩ, without Filter called	20 msec/range change
Ω with Filter 100	560 msec	All other conditions	250 msec/range change

2-44. Completely Parallel Data Acquisition

2-45. For completely parallel data acquisition perform, the following steps:

a. Acquire full digits data by connection to decade outputs. Leave inhibit lines associated with each decade open.

b. Acquire function, range, overrange and polarity data as desired. Leave associated inhibit lines open.

c. If data output is to be applied to a printer, the foregoing data could be grouped for presentation in several printer columns, with each column weighted as desired.

d. Acquire Ready Flag for use as desired.

2-46. Serial Character, Parallel Bit Acquisition

2-47. For serial character, parallel bit acquisition, perform the following steps:

a. Connect function, range, polarity, and digit outputs in parallel, as shown in Figure 2-7, or in groups of 8, 12, 16 bits, etc., as desired.

b. The user supplied clock controls the inhibit lines to determine the sequence of character acquisition. Data transfer to the output line occurs when the associated inhibit lines are high. Truth tables and acquisition format are shown in Figure 2-7.

2-48. Minimum Lines Acquisition

2-49. Minimum lines acquisition is a practical application of serial character, parallel bit acquisition, in which a user-supplied clock is placed near the 8200A to sequentially control the inhibit lines. Proceed as follows:

a. Place a customer fabricated 8-segment ring counter near the 8200A and interface it as shown in Figure 2-8.

b. Trigger the 8200A. (The Timeouts Enabled line may be programmed via interface or it may be hard-wired.)

c. When data is ready, transition of the 8200A READY signal will start the ring counter. A synchronizing pulse, sent from the ring counter's advance line, will allow the acquisition device to recognize the character being acquired on the four output lines.

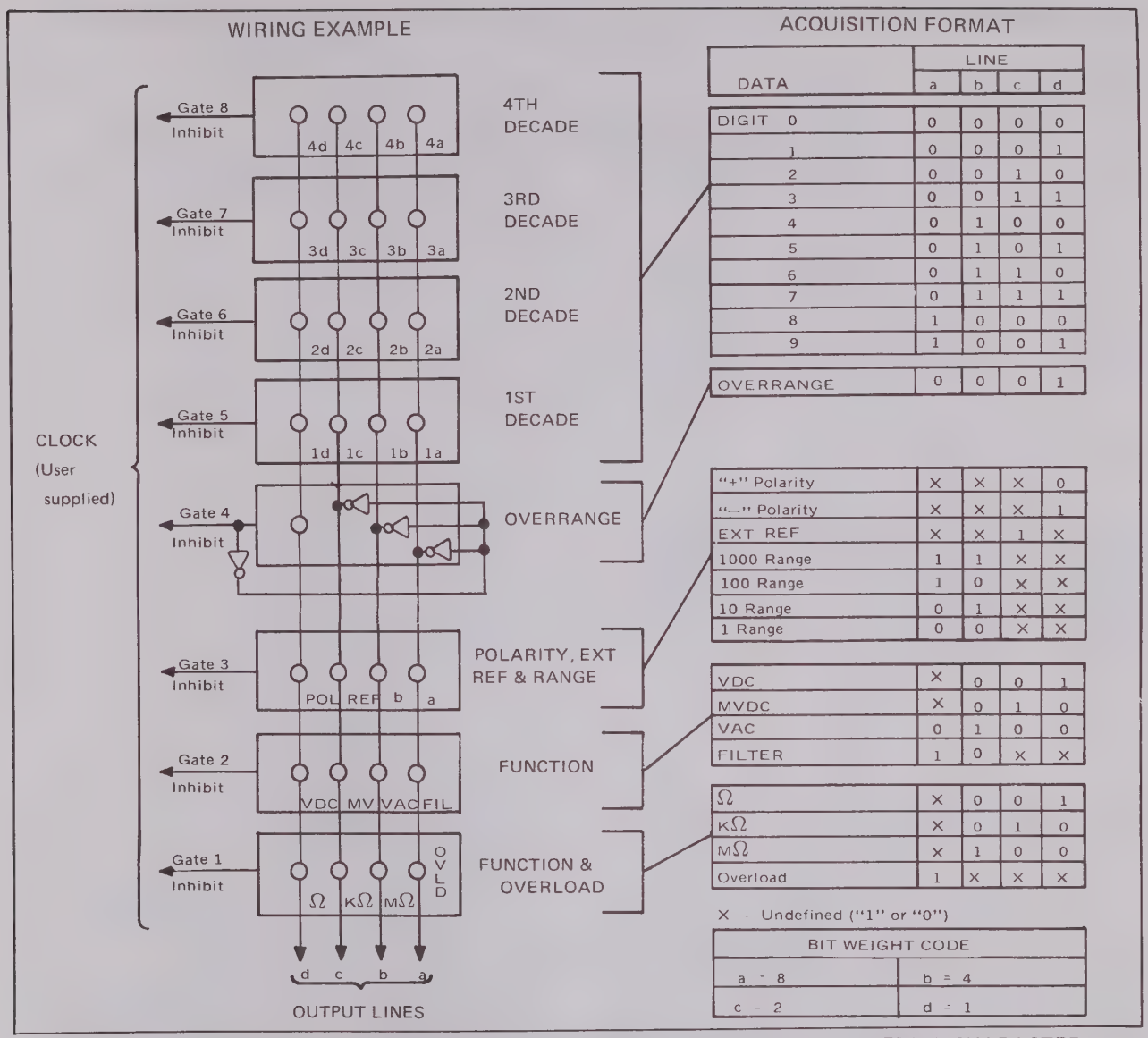

WIRING EXAMPLE
ACQUISITION FORMAT
Gate 8 Inhibit
Gate 7 Inhibit
Gate 6 Inhibit
Gate 5 Inhibit
Gate 4 Inhibit
Gate 3 Inhibit
Gate 2 Inhibit
Gate 1 Inhibit
4d 4c 4b 4a
3d 3c 3b 3a
2d 2c 2b 2a
1d 1c 1b 1a
POL REF b a
VDC MV VAC FIL
Ω KΩ MΩ OVLD
CLOCK (User supplied)
4TH DECADE
3RD DECADE
2ND DECADE
1ST DECADE
OVERRANGE
POLARITY, EXT REF & RANGE
FUNCTION
FUNCTION & OVERLOAD
d c b a
OUTPUT LINES
DATA
LINE a b c d
DIGIT 0 0 0 0 0
1 0 0 0 1
2 0 0 1 0
3 0 0 1 1
4 0 1 0 0
5 0 1 0 1
6 0 1 1 0
7 0 1 1 1
8 1 0 0 0
9 1 0 0 1
OVERRANGE 0 0 0 1
"+" Polarity X X X 0
"—" Polarity X X X 1
EXT REF X X 1 X
1000 Range 1 1 X X
100 Range 1 0 X X
10 Range 0 1 X X
1 Range 0 0 X X
VDC X 0 0 1
MVDC X 0 1 0
VAC 0 1 0 0
FILTER 1 0 X X
Ω X 0 0 1
KΩ X 0 1 0
MΩ X 1 0 0
Overload 1 X X X
X - Undefined ("1" or "0")
BIT WEIGHT CODE
a = 8 b = 4
c = 2 d = 1

Figure 2-7. WIRING EXAMPLE, ACQUISITION FORMAT, AND TRUTH TABLES FOR SERIAL CHARACTER, PARALLEL BIT ACQUISITION

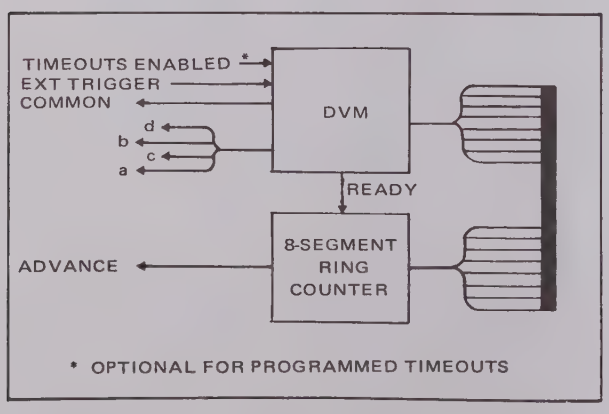


Figure 2-8. MINIMUM LINES ACQUISITION

d. An OVERLOAD line is available to serve as an alarm or priority interrupt.

2-50. Installation, theory of operation, and maintenance instructions for the Data Output Unit are covered in Section 6.

2-51. PRINTER OUTPUT UNIT

2-52. General

2-53. POU access is by means of a single edge card connector located at the rear of the instrument. See item 12 of Figure 2-1. Data may be acquired in parallel BCD format only.

2-54. The POU is self-powered and provides +5V output for operation of the Remote Control Unit (Option –08). POU truth tables and logic levels are given in Table 2-9. Functional pin connections for the POU are given in Table 2-10. POU pin connections are shown in Figure 2-5.

2-55. Control Signals

2-56. POU control signals consist of External Trigger and Autotriggering. The external trigger may be a positive or negative going signal as shown in Figure 2-3. Autotriggering is disabled by application of a Logic "0" and enabled by application of Logic "1".

Table 2-9. PRINTER OUTPUT UNIT TRUTH TABLES AND LOGIC LEVELS

OUTPUTS	LINES	OUTPUT LOGIC LEVELS	
		0 to +0.5V	+5V
Function Indicator	1	Logic "0"	Logic "1"
4 Digits BCD 8-4-2-1	16		
Range (coded)	2		
RANGE / LINE (a b): 1000 = 1 1; 100 = 1 0; 10 = 0 1; 1 = 0 0			
Overrange Digit	1		
Polarity "+" = 0 "–" = 1	1		
Ready Flag	1	Ready	Not Ready
External Trigger or Autotriggering Inputs	1	Inhibit	Enable

Table 2-10. PRINTER OUTPUT UNIT FUNCTIONAL PIN CONNECTIONS

DATA	PIN NO.	REMARKS
1st Decade		
a	24	
b	11	
c	7	Logic "0" = OV
d	8	Logic "1" = +5V
2nd Decade		
a	5	Bit Weight Code
b	4	a = 8
c	1	b = 4
d	2	c = 2
		d = 1
3rd Decade		
a	23	
b	21	
c	22	
d	19	
4th Decade		
a	29	
b	25	
c	30	
d	28	
Polarity	27	
Overrange "1"	20	
Ready Flag	26	
+5V dc	15	+5V dc power for operation of the RCU.
Common	16	
Spare Inverter	6, 3	6 ⟵▷○⟶ 3
Function Indicator	12	The Function Indicator in conjunction with range outputs and programmed function inputs to RCU provide complete function and range definition even during autorange. See Table 2-11.
Range		
a	10	Logic "0" = OV
b	9	Logic "1" = +5V
Control Inputs		
Ext Trig.	13	See Paragraph 2-55.
Auto Trig.	14	
Disable		

Table 2-11. PRINTER OUTPUT UNIT RANGE/FUNCTION INDICATOR CODING

FUNCTION PROGRAMMED	RANGE a	RANGE b	FUNCTION INDICATOR	FUNCTION CALLED	RANGE CALLED
VDC, MVDC	0	1	0	MVDC	10
VDC, MVDC	1	0	0	MVDC	100
VDC, MVDC	0	0	1	VDC	1
VDC, MVDC	0	1	1	VDC	10
VDC, MVDC	1	0	1	VDC	100
VDC, MVDC	1	1	1	VDC	1000
VAC	0	0	1	VAC	1
VAC	0	1	1	VAC	10
VAC	1	0	1	VAC	100
VAC	1	1	1	VAC	1000
Ω*	1	0	0	Ω	100
KΩ	1	0	0	Ω	100
KΩ	0	0	1	KΩ	1
KΩ	0	1	1	KΩ	10
KΩ	1	0	1	KΩ	100
KΩ	1	1	1	KΩ	1000
KΩ	0	1	0	MΩ	10
MΩ	0	1	0	MΩ	10

* When Ω or MΩ function is programmed, the range is automatically commanded.

2-57. Data Acquisition

2-58. Parallel data acquisition is accomplished by the following steps:

a. Acquire full digits data by connection to decade outputs.

b. Acquire function, range, overrange, and polarity data as desired.

c. Foregoing data could be grouped for presentation in several printer columns, with each column weighted as desired.

d. Acquire Ready Flag for use as desired.

2-59. Installation, theory of operation, and maintenance instructions for the Printer Output Unit are covered in Section 6.

2-60. OPERATING NOTES

2-61. Overload Protection

2-62. The 8200A is protected against overload in each function and on all ranges. Table 2-12 lists the maximum voltages that may safely be applied to the DVM.

2-63. Guarded Measurements

2-64. The 8200A employs a system of shields and guards that functions to minimize unwanted signals and induced noise, thereby providing the user with a versitile systems DVM capable of fully-floated measurements without significant degradation.

2-65. Non-floated measurements are the usual case. Under these conditions, strap the front panel GD (guard) terminal to the LO input terminal using the shorting link provided.

2-66. In general, guarded voltage and resistance measurements will be necessary under the following conditions:

a. When long signal leads are used and signal source impedance is high.

b. When the DVM is operating in the presence of high-level radiated noise: The most common example is stray fields at the power line frequency.

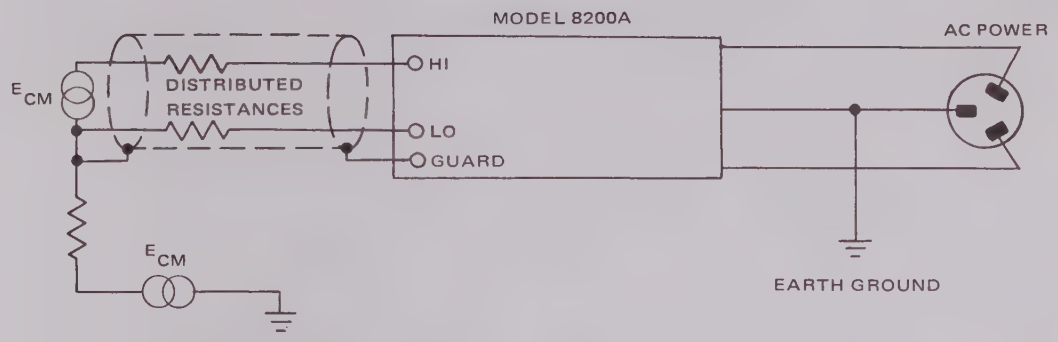
c. When floated measurements are made and unwanted signals induced from high potential and/or high frequency common mode voltages are present.

2-67. Figure 2-9 shows two connection configurations that use guarded inputs during voltage measurements to reduce unwanted signals that are generated by common to normal mode signal conversion. When making unfiltered measurements in MVDC mode, connect the GD (guard) terminal connects to the LO input terminal to reduce the influence of internally generated noise.

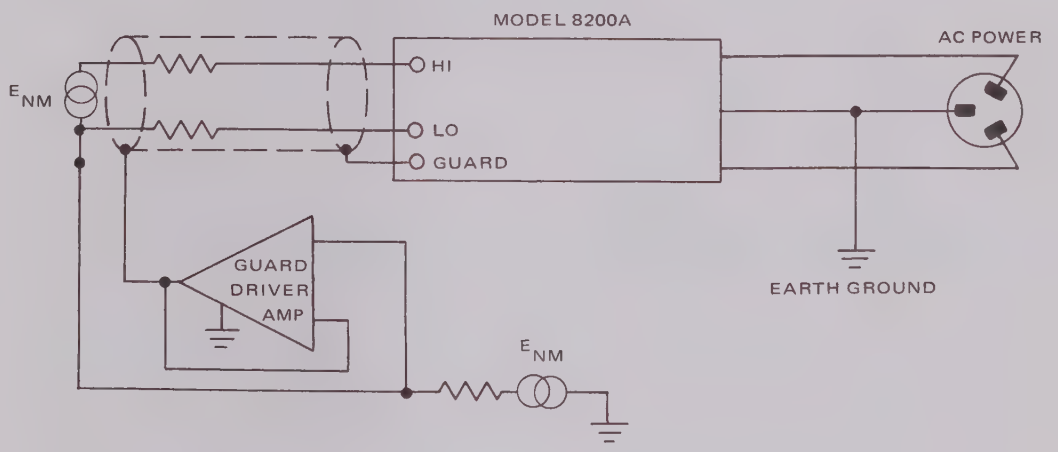
Table 2-12. OVERLOAD PROTECTION CHARACTERISTICS

FUNCTION	MAXIMUM SAFE INPUT	FORM OF PROTECTION
VDC	±1200V dc or 1100V rms (± 1500V peak) continuously on any range.	Circuit Design
MVDC	±1200V dc or 1100V rms for 15 seconds on either range. * ±300V dc or rms continuously on either range. *	
VAC	1100V rms continuously on any range ±1100V dc (peak ac plus dc may not exceed ±1500V).	
Ω	20V rms	Fuse: 100 mA fuse, with spare, located on Ohms Converter pcb.
KΩ, MΩ	130V rms *	
EXT REF	$V_{ER} + V_{CM}$ not to exceed 25 volts where V_{ER} is External Reference input voltage and V_{CM} is voltage between External Reference Input common and Instrument Input Common.	Circuit Design
Any	Overload limit "LO" to "GD" (Guard) is ±100V dc or peak ac.	A protection circuit causes an internal warning lamp to illuminate when this limit is exceeded. Lamp is visible through front panel display window.

* When this maximum safe limit is exceeded, but input is less than ±1200V dc or 1100V rms, damage will be limited to an input resistor on millivolts board or range resistor on ohms board. Overloads in excess of 130V to 1000V cannot damage any active circuits.



CONNECTIONS TO THE GUARD FROM THE COMMON-MODE SOURCE



E_{NM} = NORMAL MODE VOLTAGE

E_{CM} = COMMON MODE VOLTAGE

USING AN EXTERNAL AMPLIFIER TO DRIVE THE GUARD WHERE COMMON MODE SIGNAL CANNOT BE CAPACITIVELY LOADED

Figure 2-9. SUGGESTED GUARD CONNECTIONS FOR REDUCTION OF COMMON MODE-TO-NORMAL MODE SIGNAL CONVERSION

Section 4
Maintenance (Preliminary)

4-1. INTRODUCTION

4-2. This section contains preliminary calibration procedures for the 8200A. If any difficulties are encountered, contact the nearest John Fluke Sales Representative, Service Center, or the John Fluke Mfg. Co., Inc., P. O. Box 7428, Seattle, Washington 98133.

4-3. CALIBRATION PROCEDURES

4-4. Introduction

4-5. The 8200A should be operated for a minimum period of one hour with all covers installed before calibration is attempted. After this warm-up period is completed, remove the top dust cover to gain access to internal calibration points. It is also necessary to remove the screws which hold the top inner guard cover in place so that it too can be removed when required. Most adjustments and test points are labeled on the guard cover.

4-6. Basic Instrument (less options)

4-7. Calibration of the basic instrument requires the following test equipment:

1. FLUKE Model 332B DC Voltage Standard (Accuracy of ±20 ppm to 10V and ±30 ppm to 1000V)

2. FLUKE Model 895A Differential Voltmeter (Accuracy of ±25 ppm to 10V)

a. Select VDC, FILTER FUNCTION and 1V RANGE.

b. Connect (link) the INPUT LO and GD terminals. This connection must be maintained throughout the calibration procedure.

c. Remove the top guard cover.

d. Connect the dc voltmeter to A1TP2 (+) and TP3 (–). Adjust A1R12 (15V Adj.) for +15 ±0.01V dc.

e. Connect the dc voltmeter to A7TP2 (+7V TP) and A7TP1 (–). Adjust A7R7 (+7V) for +7V dc ±100 uV.

f. Connect a shorting jumper between the INPUT HI and LO terminals.

g. Connect the dc voltmeter to A4TP2 (+) and INPUT LO (–). Adjust A4R22 (VDC ZERO) for 0 ±10 uV dc at TP2.

h. Disconnect the dc voltmeter and remove the shorting jumper from between the INPUT terminals.

i. Set the top guard cover in place and then connect a shorting jumper between A6TP2 and TP3 for continuous measurement. These test points are described and labeled on the guard cover.

j. Apply –0.00055V dc to the INPUT terminals and adjust A7R27 (–ZERO) for a uniform flicker between 5 and 6 in the lowest readout digit.

k. Apply +0.00055V dc and adjust A7R38 (+ZERO) for a uniform flicker between 5 and 6 in the lowest digit.

l. Apply +0.70055V dc and adjust A7R10 (+CAL) for a uniform flicker between 5 and 6 in the lowest digit.

m. Apply +0.80055V dc and adjust A7R53 (8 LADDER) for a uniform flicker between 5 and 6 in the lowest digit.

n. Apply –0.70055V dc and adjust A7R33 (–CAL) for a uniform flicker between 5 and 6 in the lowest digit.

o. Apply +0.09955V dc and adjust A7R43 (REMAINDER) for a uniform flicker between 5 and 6 in the lowest digit.

p. Apply +0.09995V dc and adjust A7R48 (TRIP POINT) for a uniform flicker between +0.0999 and +0.1000 in the readout.

q. Select 10V RANGE and then apply an input of +10.0055V dc.

r. Adjust A4R3 (10 VDC) for a uniform flicker between 5 and 6 in the lowest digit.

s. Select 100V RANGE and then apply an input of +100.055V dc.

t. Adjust A4R5 (100VDC) for a uniform flicker between 5 and 6 in the lowest digit.

u. Select 1000V RANGE and then apply an input of +1000.55V dc.

v. Adjust A4R7 (1000 VDC) for a uniform flicker between 5 and 6 in the lowest digit.

w. Disconnect the test equipment and the shorting jumper between A6TP2 and TP3.

4-8. Calibration of the basic instrument is complete. The top guard and dust covers can now be installed if no options are included. Option calibration procedures are given in the following paragraphs.

4-9. Options

4-10. Calibration of the 01 through 04 Options is done using the following procedures. All unmentioned options do not require calibration. Required test equipment is listed at the beginning of each procedure. Most adjustments and test points are labeled on the top guard cover.

NOTE

The basic instrument must be calibrated (paragraph 4-6 through 4-8) before options are calibrated.

4-11. AC CONVERTER (−01 OPTION). Calibration of the −01 Option requires an ac voltage standard such as the HP 745A/746A.

a. Select VAC FUNCTION and 1000V RANGE.

b. Connect a shorting jumper between A6TP2 and TP3 to establish continuous measurement mode.

c. Apply a 9.55V rms, 500 Hz, signal to the INPUT HI and LO terminals.

d. Adjust A5R48 (AC ZERO) for a uniform flicker between 5 and 6 in the lowest readout digit.

e. Remove rms input and connect a shorting jumper between the INPUT HI and LO terminals.

f. Select 1V RANGE, observing that readout is 5 or less (lowest digit).

g. Remove the shorting jumper between the INPUT terminals and A6TP2 and TP3.

h. Apply the rms input voltages on the ranges indicated in Table 4-1. Adjust or check readout for indication corresponding to rms input. Tolerances are given for lowest digit.

Table 4-1. AC CONVERTER ADJUSTMENTS AND CHECKS

INPUT VOLTAGE (RMS)	INPUT FREQ	RANGE	ADJUSTMENT	8200A CKT. DESIG.	READOUT TOLERANCE (lowest digit)
500.0	500 Hz	1000	1000 - L.F.	R46	±1 digit
500.0	30 kHz	1000	1000 - H.F.	C2	±1 digit
1.0000	500 Hz	1	1 - L.F.	R23	±1 digit
1.0000	50 kHz	1	1 - H.F.	C11	±1 digit
.001	50 kHz	1	Check	—	±2 digit
1.0000	100 kHz	1	Check	—	±30 digits
1.0000	20 kHz	1	Check	—	±5 digits
1.0000	50 Hz	1	Check	—	±7 digits
10.000	500 Hz	10	10 - L.F.	R24	±1 digit
10.000	50 kHz	10	10 - H.F.	C15	±1 digit
100.00	500 Hz	100	100 - L.F.	R25	±1 digit
100.00	50 kHz	100	100 - H.F.	C16	±1 digit
1000.00	10 kHz	1000	Check (wait 30 sec)	—	±10 digits

i. Disconnect test equipment. Calibration of the −01 Option is completed.

4-12. MILLIVOLT (−02 OPTION). Calibration of the −02 Option requires the following test equipment:

1. FLUKE Model 332B DC Voltage Standard (Accuracy of ±30 ppm to 10V)

2. FLUKE Model 720A K-V Divider (±0.1ppm linearity).

a. Select MVDC and FILTER FUNCTION and 10 MVDC RANGE.

b. Connect a shorting jumper between the INPUT HI and LO terminals.

c. Rotate MV ZERO control (accessible through front panel) throughout its range, observing that the readout changes ±70 digits. If necessary, adjust A3R15 (MV ZERO) to provide a ±70 digit range for the front panel MV ZERO control.

d. Connect a shorting jumper between A6TP2 and TP3 to establish continuous measurement mode.

e. Adjust front panel MV ZERO control for a uniform flicker between + and – sign in the readout.

f. Remove shorting jumper between INPUT terminals.

g. Connect a shielded, parallel network consisting of a 1M resistor and a 0.1 uf capacitor between the INPUT HI and LO terminals. Adjust A3R13 (MV BIAS CURRENT) for 0.0000 ±5 digit readout.

h. Connect a shorting jumper between the INPUT HI and LO terminals. Adjust A3R15 (MV ZERO) for a uniform flicker between + and – sign in the readout.

i. Repeat steps f through h until the specified resuslts are obtained.

j. Remove shorting jumper between INPUT HI and LO terminals.

k. Interconnect the voltage standard and K-V divider. Apply the K-V divider output to the INPUT terminals of the 8200A.

l. Set the voltage standard output to 0V and the K-V divider to .100000. Adjust front panel MV ZERO for uniform flicker between + and – sign in the readout.

m. Select the 100 MVDC RANGE and then set the voltage standard output to +1V. Adjust A3R24 (100 MV) for a readout of +100.00 ±2 digits.

n. Reverse voltage standard output polarity (–1V), observing that the readout is –100.00 ±2 digits.

o. Set voltage standard output to 0V and the K-V divider to .010000.

p. Select 10 MVDC RANGE and then adjust front panel MV ZERO for a uniform flicker between + and – sign in the readout.

q. Set the voltage standard output to +1V and record the 8200A readout. Reverse output polarity of voltage standard and compare 8200A readout to previous readout. If readouts are different, adjust front panel MV ZERO to compensate.

r. Set voltage standard output to +1V and adjust A3R26 (10 MV) for a readout of +10.000 ±2 digits.

s. Reverse voltage standard output polarity (–1V), observing that the readout is –10.000 ±2 digits.

t. Disconnect the test equipment. Calibration of the –02 Option is completed.

4-13. OHMS (-03 OPTION). Calibration of the –03 Option requires the use of the following calibrated resistances at 23°C ±5°C:

1. 100 Ω ±0.01%
2. 1K ±0.0035%
3. 10K ±0.0035%
4. 100K ±0.0035%
5. 1M ±0.007%
6. 10M ±0.03%

NOTE

Calibrated resistances include lead resistance and contact resistance to INPUT terminals of 8200A.

a. Select KΩ and FILTER FUNCTION and 1000K RANGE.

b. Connect a shorting jumper between A6TP2 and TP3 to establish continuous measurement mode.

c. Connect 1M resistance to INPUT terminals and adjust A2R4 (1000K) for a readout which corresponds to the exact value of the input resistance.

d. Disconnect 1M resistance and select MΩ FUNCTION and 10 MΩ RANGE.

e. Connect 10M resistance to INPUT terminals and adjust A2R1 (10M) for a readout which corresponds to the exact value of input resistance. Allowable tolerance is ±1 digit in the lowest readout digit.

f. Disconnect 10M resistance and select KΩ FUNCTION and 100K Ω RANGE.

g. Connect 100K resistance to INPUT terminals and adjust A2R6 (100K) for a readout which corresponds to the exact value of input resistance.

h. Disconnect 100K resistance and select 10K Ω RANGE.

i. Connect 10K resistance to INPUT terminals and adjust A2R8 (10K) for a readout which corresponds to the exact value of input resistance.

j. Disconnect 10K resistance and select 1K Ω RANGE.

k. Connect 1K resistance to INPUT terminals and adjust A2R10 (1K) for a readout which corresponds to the exact value of input resistance.

l. Disconnect 1K resistance and select Ω FUNCTION and 100 Ω RANGE.

m. Connect 100 Ω resistance to INPUT terminals and adjust A2R12 (100 Ω) for a readout which corresponds to the exact value of input resistance.

n. Disconnect the test equipment. Calibration of the –03 Option is completed.

4-14. EXTERNAL REFERENCE (–04 OPTION). Calibration of the –04 Option requires the following test equipment:

1. FLUKE Model 332B DC Voltage Standard (Accuracy of ±20 ppm to 10V)

2. FLUKE Model 720A K-V Divider (±0.1 ppm linearity)

a. Select VDC, FILTER, and EXT REF FUNCTIONS and 1V RANGE.

b. Connect a shorting jumper between A6TP2 and TP3 to establish continuous measurement mode.

c. Interconnect the voltage standard and K-V divider. Also apply the voltage standard output to the EXT REF terminals of the ANALOG CONNECTOR on the the rear panel of the 8200A. Apply the K-V divider output to the INPUT terminals on the front panel of the 8200A.

d. Set the K-V divider to .100055 and the voltage standard output to +10V.

e. Adjust A11R12 (10V) for a uniform flicker between 5 and 6 in the lowest readout digit.

f. Set the voltage standard output to +3V and adjust A11R12 (3V) for a uniform flicker between 5 and 6 in the lowest digit.

g. Repeat steps d. through f. until the specified results are obtained.

h. Disconnect the test equipment. Calibration of the –04 Option is completed. The top guard cover and dust cover can now be installed.

Section 6

Option & Accessory Information

6-1. INTRODUCTION

6-2. This section of the manual contains information pertaining to the accessories and options available for your instrument.

6-3. ACCESSORY INFORMATION

6-4. The accessory information, if applicable, will contain details concerning accessories that may be used with this particular instrument.

6-5. OPTION INFORMATION

6-6. Each of the options available for this instrument, if any, are described separately under headings containing the option number. The option descriptions contain applicable operating and maintenance instructions and field installation procedures. A complete list of replaceable parts for each option is contained at the end of that option description.

Accessory

Rack Mounting Fixtures

6-1. INTRODUCTION

6-2. The FLUKE half-rack instruments can be mounted in standard 19 inch equipment racks in various configurations. A single instrument can be rack mounted with either a left or right offset. Dual mounting of two instruments of the same type is also possible. Rack mounting kits are as follows:

OFFSET	M03-200-607
DUAL	M03-200-606

6-3. INSTALLATION

6-4. Procedures for installation of rack mounting kits are given in the following illustrations. Each illustration is identified with a form number in the lower left-hand corner. This form number is related to the kit number as follows:

FORM NO.	RACK KIT	CONFIGURATION
A409	M03-200-607	OFFSET
A410	M03-200-606	DUAL

Appendix A

Federal Supply Code for Manufacturers

A-1. CODE TO NAME

A-2. The following five-digit code numbers are listed in numerical sequence along with the manufacturer's name and address to which the code has been assigned. The Federal Supply Code has been taken from Cataloging Handbook H 4-2, Code to Name.

00213 Sage Electronics Corp.
Rochester, New York

00327 Welwyn International, Inc.
Westlake, Ohio

00656 Aerovox Corp.
New Bedford, Massachusetts

00779 AMP Inc.
Harrisberg, Pennsylvania

01121 Allen-Bradley Co.
Milwaukee, Wisconsin

01281 TRW Semiconductors
Lawndale, California

01295 Texas Instruments, Inc.
Semiconductor Components Div.
Dallas, Texas

01686 RCL Electronics Inc.
Manchester, New Hampshire

01730 Deleted

01884 Dearborn Electronics Inc.
Orlando, Florida

02114 Ferroxcube Corp.
Saugerties, New York

02606 Replaced by 15801

02660 Amphenol-Borg Elect. Corp.
Broadview, Illinois

02799 Arco Capacitors, Inc.
Los Angeles, California

03614 Replaced by 71400

03651 Replaced by 44655

03797 Eldema Corp.
Compton, California

03877 Transitron Electronic Corp.
Wakefield, Massachusetts

03888 Pyrofilm Resistor Co., Inc.
Cedar Knolls, New Jersey

03911 Clairex Corp.
New York, New York

03980 Muirhead Instruments, Inc.
Mountainside, New Jersey

04009 Arrow Hart and Hegemen
Electronic Company
Hartford, Connecticut

04062 Replaced by 72136

04202 Replaced by 81312

04217 Essex Wire Corp.
Wire & Cable Div.
Anaheim, California

04221 Aemco
Div. of Midtex Inc.
Mankato, Minnesota

04645 Replaced by 75376

04713 Motorola Semiconductor
Products Inc.
Phoenix, Arizona

05082 Replaced by 94154

05236 Jonathan Mfg. Co.
Fullerton, California

05277 Westinghouse Electric Corp.
Semiconductor Dept.
Youngwood, Pennsylvania

05278 Replaced by 43543

05279 Southwest Machine and Plastic Co.
505 S. Vermont Ave.
Glendora, California

05397 Union Carbide Corp.
Electronics Div.
Cleveland, Ohio

05571 Sprague Electric Co.
Pacific Div.
Los Angeles, California

05704 Alac, Inc.
Glendale, California

05820 Wakefield Engineering Ind.
Wakefield, Massachusetts

06001 General Electric Company
Capacitor Department
Irmo, South Carolina

06136 Replaced by 63743

06473 Amphenol Space & Missile Sys.
Chatsworth, California

06555 Beede Electrical Instrument Co.
Penacook, New Hampshire

06739 Electron Corp.
Littletown, Colorado

06743 Clevite Corp.
Cleveland, Ohio

06751 Semcor Div. Components
Phoenix, Arizona

06860 Gould National Batteries Inc.
City of Industry, California

06980 Eitel-McCullough, Inc.
San Carlos, California

07115 Replaced by 14674

07138 Westinghouse Electric Corp.
Electronic Tube Div.
Elmira, New York

07263 Fairchild Semiconductor
Div. of Fairchild Camera
& Instrument Corp.
Mountain View, California

07344 Bircher Co., Inc.
Rochester, New York

07792 Lerma Engineering Corp.
Northampton, Massachusetts

07910 Continental Device Corp.
Hawthorne, California

08530 Reliance Mica Corp.
Brooklyn, New York

08792 CBS Electronics Semiconductor
Operations-Div. of CBS Inc.
Lowell, Massachusetts

08806 General Electric Co.
Miniature Lamp Dept.
Cleveland, Ohio

08863 Nylomatic Corp.
Norrisville, Pennsylvania

08988 Skottie Electronics Inc.
Archbald, Pennsylvania

09353 Cand K Components Inc.
Watertown, Massachusetts

09922 Burndy Corp.
Norwalk, Connecticut

11236 CTS of Berne, Inc.
Berne, Indiana

11237 Chicago Telephone of Calif. Inc.
South Pasadena, California

11358 CBS Electronics
Div. of CBS Inc.
Newburyport, Massachusetts

11403 Best Products Co.
Chicago, Illinois

11503 Keystone Mfg.
Div. of Avis Industrial Corp.
Warren, Michigan

12014 Chicago Rivet & Machine Co.
Bellwood, Illinois

12040 National Semiconductor Corp.
Danburry, Connecticut

12060 Diodes, Inc.
Chatsworth, California

12136 Philadelphia Handle Co.
Camden, New Jersey

12323 Presin Co., Inc.
Shelton, Connecticut

12327 Freeway Washer & Stamping Co.
Cleveland, Ohio

12400 Replaced by 75042

12617 Hamlin Inc.
Lake Mills, Wisconsin

12697 Clarostat Mfg. Co.
Dover, New Hampshire

12749 James Electronics
Chicago, Illinois

12856 Micrometals
Sierra Madre, California

12954 Dickson Electronics Corp.
Scottsdale, Arizona

13606 Sprague Electric Co.
Transistor Div.
Concord, New Hampshire

13839 Replaced by 23732

14099 Semtech Corp.
Newbury Park, California

14193 California Resistor Corp.
Santa Monica, California

14298 American Components, Inc.
Conshohocken, Pennsylvania

14655 Cornell-Dubilier Electronics
Newark, New Jersey

14674 Corning Glass Works
Corning, New York

14752 Electro Cube Inc.
San Gabriel, California

14869 Replaced by 96853

15636 Elec-Trol Inc.
Northridge, California

15801 Fenwal Electronics Inc.
Framingham, Massachusetts

15818 Amelco Semiconductor
Div. of Teledyne Inc.
Mountain View, California

15849 Useco, Inc.
Mt. Vernon, New York

15909 Replaced by 17870

16332 Replaced by 28478

16473 Cambridge Scientific Ind. Inc.
Cambridge, Maryland

16742 Paramount Plastics
Downey, California

16758 Delco Radio
Div. of General Motors
Kokomo, Indiana

17069 Circuit Structures Lab.
Upland, California

17856 Siliconix, Inc.
Sunnyvale, California

17870 Daven-Div. of Thomas A. Edison
Ind. – McGraw-Edison Co.
Manchester, New Hampshire

18083 Deleted

18178 Vactec Inc.
Maryland Heights, Missouri

18736 Voltronics Corp.
Hanover, New Jersey

19429 Montronics, Inc.
Seattle, Washington

19451 Perine Machinery & Supply Co.
Seattle, Washington

19701 Electra Mfg. Co.
Independence, Kansas

20584 Enochs Mfg. Co.
Indianapolis, Indiana

22767 ITT Semiconductors
Div. of ITT
Palo Alto, California

23732 Tracor
Rockville, Maryland

24248 Southco
Division of South Chester Corp.
Lester, Pennsylvania

24655 General Radio Co.
West Concord, Massachusetts

25403 Amperex Electronic Corp.
Semiconductor & Receiving
Tube Division
Slatersville, Rhode Island

28478 Deltrol Controls Corp.
Milwaukee, Wisconsin

28480 Hewlett Packard Co.
Palo Alto, California

28520 Heyman Mfg. Co.
Kenilworth, New Jersey

30323 Illinois Tool Works Inc.
Chicago, Illinois

32539 Mura Corporation
Great Neck, New York

32767 Griffith Plastic Products Co.
Burlingame, California

32879 Advanced Mechanical Comp.
Northridge, California

33173 General Electric Co.
Tube Dept.
Owensboro, Kentucky

37942 Mallory, P. R., & Co., Inc.
Indianapolis, Indiana

38315 Honeywell Inc.
Precision Meter Div.
Manchester, New Hampshire

42498 National Company
Melrose, Massachusetts

43543 Nytronics Inc.
Transformer Co. Div.
Alpha, New Jersey

44655 Ohmite Mfg. Co.
Skokie, Illinois

49671 Radio Corp. of America
New York, New York

49956 Raytheon Company
Lexington, Maine

53021 Sangamo Electric Co.
Springfield, Illinois

55026 Simpson Electric Company
Chicago, Illinois

56289 Sprague Electric Co.
North Adams, Massachusetts

58474 Superior Electric Co.
Bristol, Connecticut

60399 Torrington Mfg. Co.
Torrington, Connecticut

62460 Deleted

63743 Ward Leonard Electric Co.
Mount Vernon, New York

64834 West Mfg. Co.
San Francisco, California

65092 Weston Instruments Inc.
Newark, New Jersey

66150 Winslow Tele-Tronics Inc.
Asbury Park, New Jersey

70563 Amperite Company
Union City, New Jersey

70903 Belden Mfg. Co.
Chicago, Illinois

71002 Birnbach Radio Co., Inc.
New York, New York

71400 Bussmann Mfg.
Div. of McGraw-Edison Co.
St. Louis, Missouri

71450 CTS Corp.
Elkhart, Indiana

71468 ITT Cannon Electric Inc.
Los Angeles, California

71482 Clare, C. P. & Co.
Chicago, Illinois

71590 Centralab
Div. of Globe Union Inc.
Milwaukee, Wisconsin

71707 Coto Coil Co., Inc.
Providence, Rhode Island

71744 Chicago Miniature Lamp Works
Chicago, Illinois

71785 Cinch Mfg. Co. & Howard
B. Jones Div.
Chicago, Illinois

72005 Driver, Wilber B., Co.
Newark, New Jersey

72092 Replaced by 06980

72136 Electro Motive Mfg. Co.
Willimantic, Connecticut

72259 Nytronics Inc.
Berkeley Heights, New Jersey

72354 Deleted

72619 Dialight Corp.
Brooklyn, New York

72653 G. C. Electronics
Rockford, Illinois

72665 Replaced by 90303

72794 Dzus Fastener Co., Inc.
West Islip, New York

72928 Gudeman Co.
Chicago, Illinois

72982 Erie Tech. Products Inc.
Erie, Pennsylvania

73138 Beckman Instruments Inc.
Helipot Division
Fullerton, California

73293 Hughes Aircraft Co.
Electron Dynamics Div.
Newport Beach, California

73445 Amperex Electronic Corp.
Hicksville, New York

73559 Carling Electric Inc.
Hartford, Connecticut

73586 Circle F Industries
Trenton, New Jersey

73734 Federal Screw Products, Inc.
Chicago, Illinois

73743 Fischer Special Mfg. Co.
Cincinnati, Ohio

73899 JFD Electronics Co.
Brooklyn, New York

73949 Guardian Electric Mfg. Co.
Chicago, Illinois

74199 Quam Nichols Co.
Chicago, Illinois

74217 Radio Switch Corp.
Marlboro, New Jersey

74276 Signalite Inc.
Neptune, New Jersey

74306 Piezo Crystal Co.
Carlisle, Pennsylvania

74542 Hoyt Elect. Instr. Works
Penacook, New Hampshire

74970 Johnson, E. F., Co.
Waseca, Minnesota

75042 IRC Inc.
Philadelphia, Pennsylvania

75376 Kurz-Kasch, Inc.
Dayton, Ohio

75382 Kulka Electric Corp.
Mt. Vernon, New York

75915 Littlefuse Inc.
Des Plaines, Illinois

76854 Oak Mfg. Co.
Crystal Lake, Illinois

77342 Potter & Brumfield
Div. of Amer. Machine & Foundry
Princeton, Indiana

77969 Rubbercraft Corp. of Calif. LTD
Torrance, California

78189 Shakeproof
Div. of Illinois Tool Works
Elgin, Illinois

78277 Sigma Instruments, Inc.
South Braintree, Massachusetts

78488 Stackpole Carbon Co.
St. Marys, Pennsylvania

78553 Tinnerman Products
Cleveland, Ohio

79136 Waldes Kohinoor Inc.
Long Island City, New York

79497 Western Rubber Company
Goshen, Indiana

79963 Zierick Mfg. Corp.
New Rochelle, New York

80031 Mepco
Div. of Sessions Clock Co.
Morristown, New Jersey

80145 API Instruments Co.
Chesterland, Ohio

80183 Sprague Products
North Adams, Massachusetts

80294 Bourns Inc.
Riverside, California

80583 Hammarlund Co., Inc.
Mars Hill, North Carolina

80640 Stevens, Arnold Inc.
Boston, Massachusetts

81073 Grayhill Inc.
La Grange, Illinois

81312 Winchester Electronics
Div. of Litton Industries
Oakville, Connecticut

81439 Therm-O-Disc Inc.
Mansfield, Ohio

81483 International Rectifier Corp.
El Segundo, California

81590 Korry Mfg. Co.
Seattle, Washington

82376 Deleted

82389 Switchcraft Inc.
Chicago, Illinois

82415 Price Electric Corp.
Frederick, Maryland

82872 Roanwell Corp.
New York, New York

82877 Rotron Mfg. Co., Inc.
Woodstock, New York

82879 ITT Wire & Cable Div.
Pawtucket, Rhode Island

83003 Varo Inc.
Garland, Texas

83298 Bendix Corp.
Electric Power Division
Eatontown, New Jersey

83330 Smith, Herman H., Inc.
Brooklyn, New York

83478 Rubbercraft Corp. of America
New Haven, Connecticut

83594 Burroughs Corp.
Electronic Components Div.
Plainfield, New Jersey

83740 Union Carbide Corp.
Consumer Products Div.
New York, New York

84171 Arco Electronics, Inc.
Great Neck, New York

84411 TRW
Ogallala, Nebraska

86577 Precision Metal Products
Stoneham, Massachusetts

86684 Radio Corp. of America
Electronic Components & Devices
Harrison, New Jersey

86689 Deleted

87034 Marco-Oak Inc.
Anaheim, California

88419 Use 14655

88690 Replaced by 04217

89536 Fluke, John Mfg. Co., Inc.
Seattle, Washington

89730 Replaced by 08806

90201 Mallory Capacitor Co.
Indianapolis, Indiana

90215 Best Stamp & Mfg. Co.
Kansas City, Missouri

90211 Square D Co.
Chicago, Illinois

90303 Mallory Battery Co.
Tarrytown, New York

91293 Johanson Mfg. Co.
Boonton, New Jersey

91407 Replaced by 58474

91637 Dale Electronics Inc.
Columbus, Nebraska

91662 Elco Corp.
Willow Grove, Pennsylvania

91737 Gremar Mfg. Co., Inc.
Wakefield, Massachusetts

91802 Industrial Devices, Inc.
Edgewater, New Jersey

91836 King's Electronics
Tuckahoe, New York

91929 Honeywell Inc.
Micro Switch Div.
Freeport, Illinois

91934 Miller Electric Co., Inc.
Pawtucket, Rhode Island

93332 Sylvania Electric Products
Semiconductor Products Div.
Woburn, Massachusetts

94145 Replaced by 49956

94154 Tung-Sol
Div. of Wagner Electric Corp.
Newark, New Jersey

95146 Alco Electronics Products Inc.
Lawrence, Massachusetts

95263 Leecraft Mfg. Co.
Long Island City, New Jersey

95264 Replaced by 98278

95275 Vitramon Inc.
Bridgeport, Connecticut

95303 Radio Corp. of America
Solid State & Receiving Tube Div.
Cincinnati, Ohio

95354 Methode Mfg. Corp.
Rolling Meadows, Illinois

95712 Dage Electric Co., Inc.
Franklin, Indiana

95987 Weckesser Co., Inc.
Chicago, Illinois

96733 San Fernando Electric Mfg. Co.
San Fernando, California

96853 Rustrak Instrument Co.
Manchester, New Hampshire

96881 Thomson Industries, Inc.
Manhasset, New York

97540 Master Mobile Mounts
Div. of Whitehall Electronics Corp.
Los Angeles, California

97913 Industrial Electronic Hdware Corp.
New York, New York

97945 White, S. S. Co.
Plastics Div.
New York, New York

97966 Replaced by 11358

98094 Replaced by 49956

98278 Microdot Inc.
Pasadena, California

98291 Scalectro Corp.
Conhex Div.
Mamaroneck, New York

98388 Accurate Rubber & Plastics
Culver City, California

98743 Replaced by 12749

98925 Deleted

99120 Plastic Capacitors Inc.
Chicago, Illinois

99217 Southern Electronics Corp.
Burbank, California

99515 Marshall Industries
Capacitor Div.
Monrovia, California

Appendix B

List of Abbreviations

A,amp	ampere
ampl	amplifier
ac	alternating current
assy	assembly
BCD	binary coded decimal
cap	capacitor
car	carbon
cm	centimeter
C	centigrade
cer	ceramic
cw	clockwise
CMRR	common mode rejection ratio
comp	composition
CCW	counterclockwise
conn	connector
CRT	cathode ray tube
cps	cycles per second
db	decibel
dvm	digital voltmeter
dc	direct current
dpdt	double-pole, double-throw
dpst	double-pole, single-throw
elect	electrolytic
ext	external
f	fahrenheit
F	farad
FET	field effect transistor
flm	film
Ge	germanium
g	giga or 10^9
gnd	ground
gmv	guaranteed minimum value
grd	guard
h	henry
Hz	hertz
hf	high frequency
IC	integrated circuit
if	intermediate frequency
int	internal
kc	kilocycle
k	kilo (10^3)
lf	low frequency
mc	megacycle
M	meg or mega (10^6)
met	metal
MOS	metal oxide silicon
μ	micro or 10^{-6}
m	milli or 10^{-3}
mm	millimeter
n	nano or 10^{-9}
neg	negative
Ω	ohm
osc	oscilloscope
ppm	parts per million
piv	peak inverse voltage
p-p	peak to peak
p	pico or 10^{-12}
plstc	plastic
$\pm$	plus or minus
pos	positive
pps	pulses per second
PCB	printed circuit board
QTY	quantity
rf	radio frequency
rfi	radio frequency interference
REC	recommended
REF	reference
RH	relative humidity
res	resistor
rms	root mean square
rtry	rotary
sec	second
sect	section
S/N	serial number
Si	silicon
scr	silicon controlled rectifier
spdt	single-pole, double-throw
spst	single-pole, single-throw
sw	switch
Ta	tantalum
TC	temperature coefficient
t	tera or 10^{12}
xfmr	transformer
tstr	transistor
tvm	transistor voltmeter
uhf	ultra high frequency
vtvm	vacuum tube voltmeter
var	variable
vhf	very high frequency
vlf	very low frequency
V	volt
VCO	voltage controlled oscillator
w	watt
ww	wire wound

Appendix C

Sales Representatives & Service Centers

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HUNTSVILLE
BSC Associates, Inc.
3322 S. Memorial Parkway
P.O. Box 1273
Tel. (205) 881-6220
Zip 35807

ALASKA

SEATTLE
Showalter-Judd, Inc.
1806 S. Bush Place
Seattle, Washington 98144
Tel. (206) 324-7911

ARIZONA

*PHOENIX
Barnhill Associates
537 E. Osborn Road, Suite 4
Tel. (602) 263-1250
Zip 85012

CALIFORNIA

***LOS ANGELES
Instrument Specialists, Inc.
1109 S. Central Ave.
Glendale, California 91204
Tel (213) 245-9404

**SANTA CLARA
Instrument Specialists, Inc.
2359 De La Cruz Blvd.
Tel. (408) 244-1505
Zip 95050

SAN DIEGO
Instrument Specialists, Inc.
1909 State St.
Tel. (714) 232-2017
Zip 92101

COLORADO

*DENVER
Barnhill Associates
1170 S. Sheridan Blvd.
Tel. (303) 934-5505
Zip 80226

CONNECTICUT

HARTFORD
Instrument Representatives, Inc.
P. O. Box 165
Glastonbury, Connecticut 06033
Tel (203) 633-0777

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**ORLANDO
BCS Associates, Inc.
940 N. Fern Creek Ave.
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Tel. (305) 843-1510
Zip 32803

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BCS Associates, Inc.
1230 Briar Hill Dr.
Tel. (404) 874-9925
Zip 30306

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Industrial Electronics, Inc.
646 Queen Street
P.O. Box 135
Tel. (808) 533-6095
Zip 96817

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Cozzens & Cudahy, Inc.
9501 W. Devon Ave.
Rosemont, Illinois 60018
Tel. (312) 825-1144

INDIANA

INDIANAPOLIS
Cozzens & Cudahy, Inc.
Port O'Call Executive Ctr.
21 Beachway Drive
Tel. (317) 244-2456
Zip 46234

MARYLAND

**BALTIMORE
Electronic Marketing Assoc. Inc.
11501 Huff Court
Kensington, Maryland 20795
Tel. (301) 881-5300, 744-7700

MASSACHUSETTS

**BOSTON
Instrument Representatives, Inc.
1046 Massachusetts Avenue
Arlington, Massachusetts 02174
Tel. (617) 646-1034

MICHIGAN

DETROIT
WKM Associates, Inc.
1474 East Outer Dr.
Tel. (313) 892-2500
Zip 48234

MINNESOTA

MINNEAPOLIS
Cozzens & Cudahy, Inc.
7450 France Ave. So.
Tel. (612) 920-1022
Zip 55435

MISSOURI

ST. LOUIS
Cozzens & Cudahy, Inc.
P. O. Box 10013
Lambert Field - Zip 63145
Tel. (314) 423-1234

NEW JERSEY

**NEWARK
SBM Representatives
1519 Stuyvesant Avenue
Union, New Jersey 07083
Tel. (201) 687-8737

NEW MEXICO

*ALBUQUERQUE
Barnhill Associates
1410—D Wyoming N.E.
Tel. (505) 299-7658
Zip 87110

NEW YORK

*NEW YORK
SBM Representatives
28 Hobby Street
Pleasantville, N.Y. 10570
Tel. (914) 769-1811

**ROCHESTER
SBM Representatives
4515 Culver Rd.
Tel. (716) 226-1400
Zip 14622

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BCS Associates, Inc.
1039 E. Wendover Ave.
P.O. Box 6426
Tel. (919) 273-1918
Zip 27405

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*CLEVELAND
WKM Associates, Inc.
16141 Puritas Ave.
Tel. (216) 267-0445
Zip 44135

*DAYTON
WKM Associates, Inc.
6073 Far Hills Ave.
Tel. (513) 434-7500
Zip 45429

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Showalter-Judd, Inc.
1445 N. E. Arrington
Hillsboro, Oregon 97123
Tel. (503) 648-6372

PENNSYLVANIA

PHILADELPHIA
Electronic Marketing Assoc.
210 Goddard Blvd.—Suite 100
King of Prussia, Pennsylvania
Tel (215) 248-5050
Zip 19406

PITTSBURGH
WKM Associates, Inc.
90 Clairton Blvd.
Tel. (412) 892-2953
Zip 15236

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*DALLAS
Barnhill Associates
Suite 220
312 N. Central Express Wy.
Richardson, Texas 75080
Tel. (214) 231-2573

*HOUSTON
Barnhill Associates
Suite 332
3810 Westheimer
Tel. (713) 621-0040
Zip 77027

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WILLIAMSBURG
BCS Associates, Inc.
107 Rich Neck Road
Tel. (703) 229-5108
Zip 23185

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1806 S. Bush Place
Seattle, Washington 98144
Tel. (206) 324-7911

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1820 Pandora St.
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*MALTON
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6427 Northam Drive.
Tel. (416) 678-1500

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376 Churchill Ave. — Suite 106
Tel. (613) 725-3354

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157 (rue) St. Charles Street W.
Tel. (514) 670-1212

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** DESIGNATES REPRESENTATIVE OFFICES WITH SERVICE CENTERS
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Virrey del Pino 4071
Buenos Aires, Argentina

AUSTRALIA

Elmeasco Instruments
7 Chard Road
P.O. Box 334
Brookvale, N.S.W. Australia 2100

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Kontron GMBH & Co., Kg.
Lederergasse 16
1080 Wien
Austria

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C. N. Rood S/A
37, Place de Jamblinne de Meux
B-1040 Brussels, Belgium

BRAZIL

AMBRIEX S.A.
Av. Graca Aranha
226—6º And.
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Casilla 14588
Correo 15
Santiago, Chile

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Apartado Aereo 90687
Bogota 8, Colombia

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Copenhagen 0, Denmark

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Oy Findip AB
Postbox 52025
Helsinki 52, Finland

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Radio Equipment Antares
9, Rue Ernest Cognacq
92 Levallois — Perret
France

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Athens 19 Greece

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Gilman & Co. Ltd.
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Hong Kong

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Bombay 6, India

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Berkeh Company Ltd.
20 Salm Road, Roosevelt Ave.
Tehran, Iran

ISRAEL

R.D.T. Electronics Eng'r. Ltd.
P.O. Box 21082
Tel Aviv, Israel

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Elettronucleonica S.P.A.
7, P.zza De Angeli
20146 Milano, Italy

JAPAN

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P.O. Box 5014
International Tokyo
Japan

2-38 Junkeicho-dori
Minami-ku, Osaka, Japan

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M-C International
I.P.O. Box 1355
Seoul, Korea

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O'Connor's (Pte) Ltd.
P.O. Box 1197
Kota Kinabalu
East Malaysia

P.O. Box 91
Pataling Jaya
West Malaysia

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Eugenia 408
Departments 1 y 5
Mexico 12, D.F.

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C.N. Rood N.V.
Post Office Box 4542
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The Netherlands

Fluke (Nederland) N.V.
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Industrieterrein Noord
Tilburg, The Netherlands

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Elmeasco Instruments Pty. Ltd.
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Melbourne, Vic. 3004
Australia

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Deemtee Electrotechnics Ltd.
P.O. Box 3073
Lagos, Nigeria

NORWAY

Morgenstierne & Co. A/S
P.B. 6688 Rodelokka
Oslo 6, Norway

PAKISTAN

Pak International Operations
P.O. Box 5323
Karachi, Pakistan

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Equipamentos De Laboratorio, Ltda.
P.O. Box 1100
Lisbon, Portugal

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O'Connor's (Pte) Ltd.
Maybank House 124-126
Robinson Road
Singapore 1, Singapore

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Johannesburg, So. Africa

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Cape Town, So. Africa

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Durban, So. Africa

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General Sanjurjo 18
Madrid 3, Spain

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Erik Ferner AB
Box 56
Snormakarvagen 35
161.26 Stockholm-Bromma
Sweden

SWITZERLAND

Kontron Electronic A.G.
Hardstrasse 235
P.O. Box 193
8031 Zurich
Switzerland

TAIWAN-REPUBLIC OF CHINA

Heighten Trading Co., Ltd.
P.O. 1408
Taipel, Taiwan, 104

THAILAND

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Suriwong
Bangkok, Thailand

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Fluke International Corp.
Garnett Close
Watford, WD2 4TT
England

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Cerrito 617 - 4º Piso
Montevideo, Uruguay

VENEZUELA

Coasin C.A.
APDO, Postal 50939
Sabana Grande No. 1
Caracas, Venezuela

In Europe, contact FLUKE NEDERLAND, N.V., POST OFFICE BOX 5053, INDUSTRIETERREIN NOORD, TILBURG, THE NETHERLANDS

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FLUKE (NEDERLAND) N.V.
P. O. BOX 5053
TILBURG, THE NETHERLANDS

FLUKE REGIONAL SERVICE CENTER, UNITED KINGDOM

FLUKE INTERNATIONAL CORP.
GARNETT CLOSE
WATFORD, WD2 4TT
ENGLAND

AUTHORIZED SERVICE LABORATORIES INTERNATIONAL

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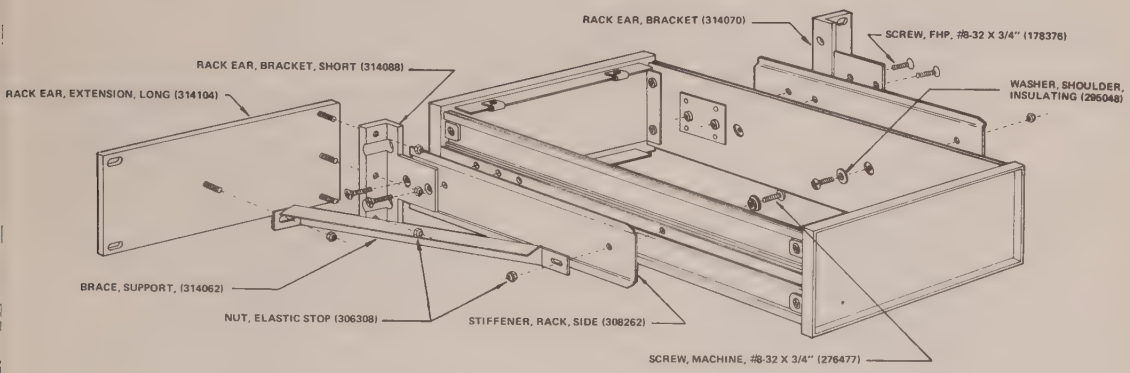
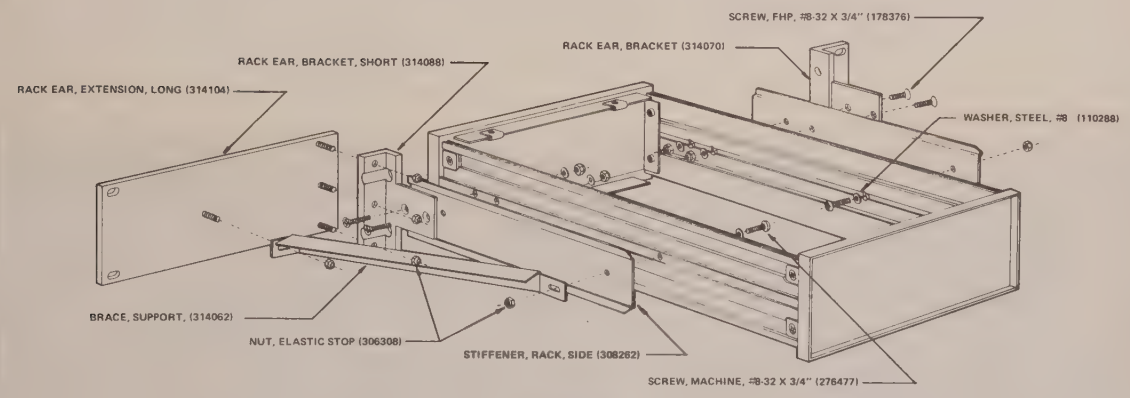
RACK MOUNTING PROCEDURE FOR MOLDED MODULE SERIES INSTRUMENTS.


RACK EAR, BRACKET (314070)
SCREW, FHP, #8-32 X 3/4" (178376)
RACK EAR, BRACKET, SHORT (314088)
RACK EAR, EXTENSION, LONG (314104)
WASHER, SHOULDER, INSULATING (295048)
BRACE, SUPPORT, (314062)
NUT, ELASTIC STOP (306308)
STIFFENER, RACK, SIDE (308262)
SCREW, MACHINE, #8-32 X 3/4" (276477)

8200A


SCREW, FHP, #8-32 X 3/4" (178376)
RACK EAR, BRACKET (314070)
RACK EAR, BRACKET, SHORT (314088)
RACK EAR, EXTENSION, LONG (314104)
WASHER, STEEL, #8 (110288)
BRACE, SUPPORT, (314062)
NUT, ELASTIC STOP (306308)
STIFFENER, RACK, SIDE (308262)
SCREW, MACHINE, #8-32 X 3/4" (276477)

OTHER INSTRUMENTS

WARNING: ALL METAL CHASSIS PARTS IN THE 8200A ARE AT GUARD POTENTIAL. THE INSULATING SHOULDER WASHERS MUST BE IN POSITION BETWEEN THE MOUNTING SCREWS AND THE GUARD CHASSIS SIDE AT THE REAR MOUNTING HOLES AS SHOWN IN THE ILLUSTRATION, OR THE GUARD WILL BE VIOLATED.

1. THIS KIT IS A DUAL PURPOSE KIT. THERE WILL BE EXTRA FASTENERS IN ANY APPLICATION. PLEASE REFER TO THE ILLUSTRATION PERTAINING TO THE PARTICULAR INSTRUMENT AT HAND.

2. REMOVE TOP AND BOTTOM COVERS.REMOVE FEET FROM BOTTOM COVER.

3. REMOVE HANDLE DISK DECALS AND REMOVE HANDLE.

4. REMOVE SIDE TRIM DECALS TO EXPOSE MOUNTING HOLES.

5. ATTACH RACK EAR, BRACKET, SHORT (314088) TO RACK EAR, EXTENSION, LONG (314104) USING NUT, ELASTIC STOP (306308) 3 PLACES AS SHOWN.

6. (8200A): POSITION STIFFENER, RACK SIDE (308262) AGAINST THE SIDE OF THE INSTRUMENT, THEN INSERT 2 #8-32 SCREWS (178376) THROUGH THE RACK EAR, STIFFENER, AND SIDE CHASSIS, ENGAGING THE CAPTIVE NUTS.

(OTHER INSTR.): POSITION STIFFENER, RACK SIDE (308262) AGAINST THE SIDE OF THE INSTRUMENT, THEN INSERT 2 #8-32 SCREWS (178376) THROUGH THE RACK EAR, STIFFENER, AND SIDE CHASSIS, FASTENING WITH A WASHER (110288) AND A NUT, ELASTIC STOP (306308).

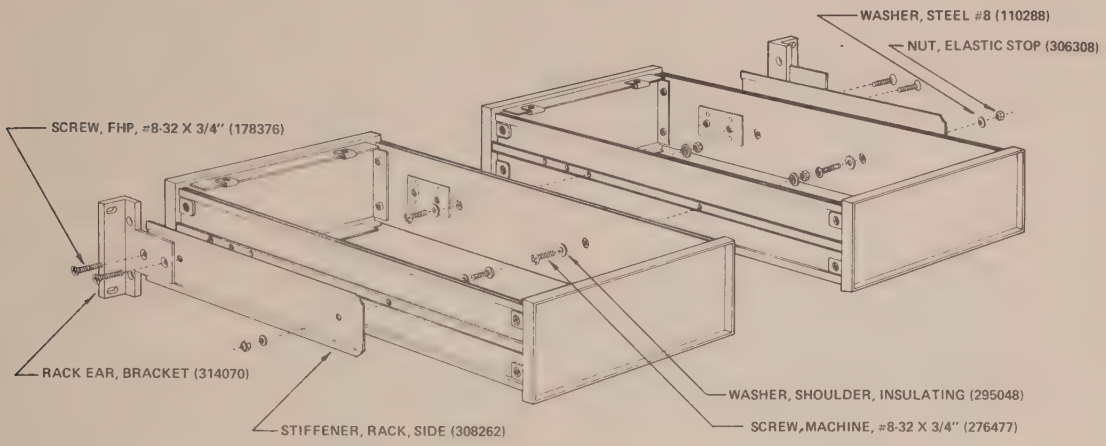
7. (8200A): INSERT A #8-32 SCREW (276477) AND WASHER, SHOULDER, INSULATING (295048) FROM THE INSIDE OF THE INSTRUMENT, THROUGH THE REAR MOUNTING HOLE IN THE SIDE CHASSIS, THEN THROUGH THE STIFFENER, AND FASTEN WITH NUT, ELASTIC STOP (306308), (SEE NOTE #8).

(OTHER INSTR.): INSERT A #8-32 SCREW (276477) AND WASHER (110288) FROM THE INSIDE OF THE INSTRUMENT, THROUGH THE REAR MOUNTING HOLE IN THE SIDE CHASSIS, THEN THROUGH THE STIFFENER, AND FASTEN WITH NUT, ELASTIC STOP (306308), (SEE NOTE #8).

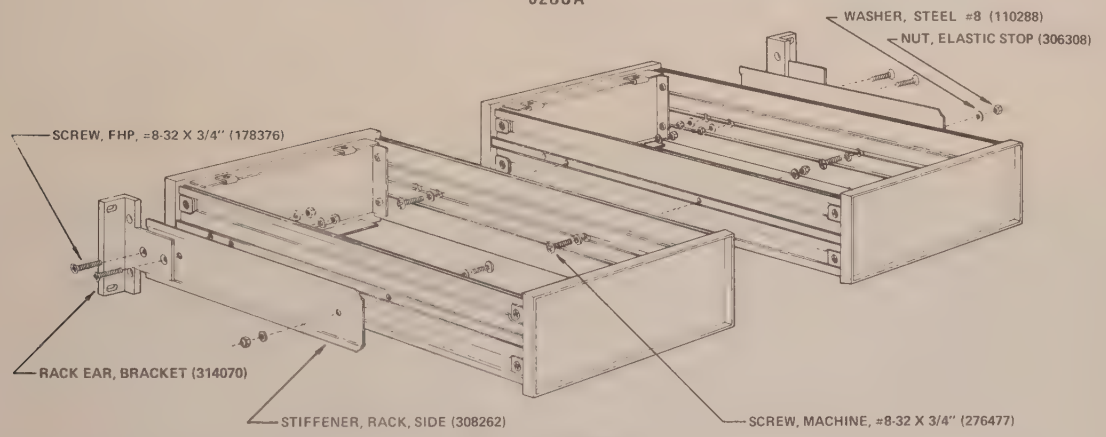
8. ON THE OFFSET SIDE MOUNT THE BRACE, SUPPORT (314062) USING 2 NUTS, ELASTIC, STOP (306308).

9. REPLACE THE TOP AND BOTTOM COVERS.

DUAL RACK MOUNTING PROCEDURE FOR MOLDED MODULE SERIES INSTRUMENTS


WASHER, STEEL #8 (110288)
NUT, ELASTIC STOP (306308)
SCREW, FHP, #8-32 X 3/4" (178376)
RACK EAR, BRACKET (314070)
STIFFENER, RACK, SIDE (308262)
WASHER, SHOULDER, INSULATING (295048)
SCREW, MACHINE, #8-32 X 3/4" (276477)

8200A


WASHER, STEEL #8 (110288)
NUT, ELASTIC STOP (306308)
SCREW, FHP, #8-32 X 3/4" (178376)
RACK EAR, BRACKET (314070)
STIFFENER, RACK, SIDE (308262)
SCREW, MACHINE, #8-32 X 3/4" (276477)

OTHER INSTRUMENTS

WARNING: ALL METAL CHASSIS PARTS IN THE 8200A ARE AT GUARD POTENTIAL. THE INSULATING SHOULDER WASHERS MUST BE IN POSITION BETWEEN THE MOUNTING SCREWS AND THE GUARD CHASSIS SIDE AS SHOWN IN THE ILLUSTRATION, OR THE GUARD WILL BE VIOLATED.

1. THIS KIT IS A DUAL PURPOSE KIT. THERE WILL BE EXTRA FASTENERS IN ANY APPLICATION. PLEASE REFER TO THE ILLUSTRATION PERTAINING TO THE PARTICULAR INSTRUMENT AT HAND.

2. REMOVE TOP AND BOTTOM COVERS AND REMOVE FEET FROM BOTTOM COVER.

3. REMOVE HANDLE DISK DECALS AND REMOVE HANDLE.

4. REMOVE SIDE TRIM DECALS TO EXPOSE MOUNTING HOLES.

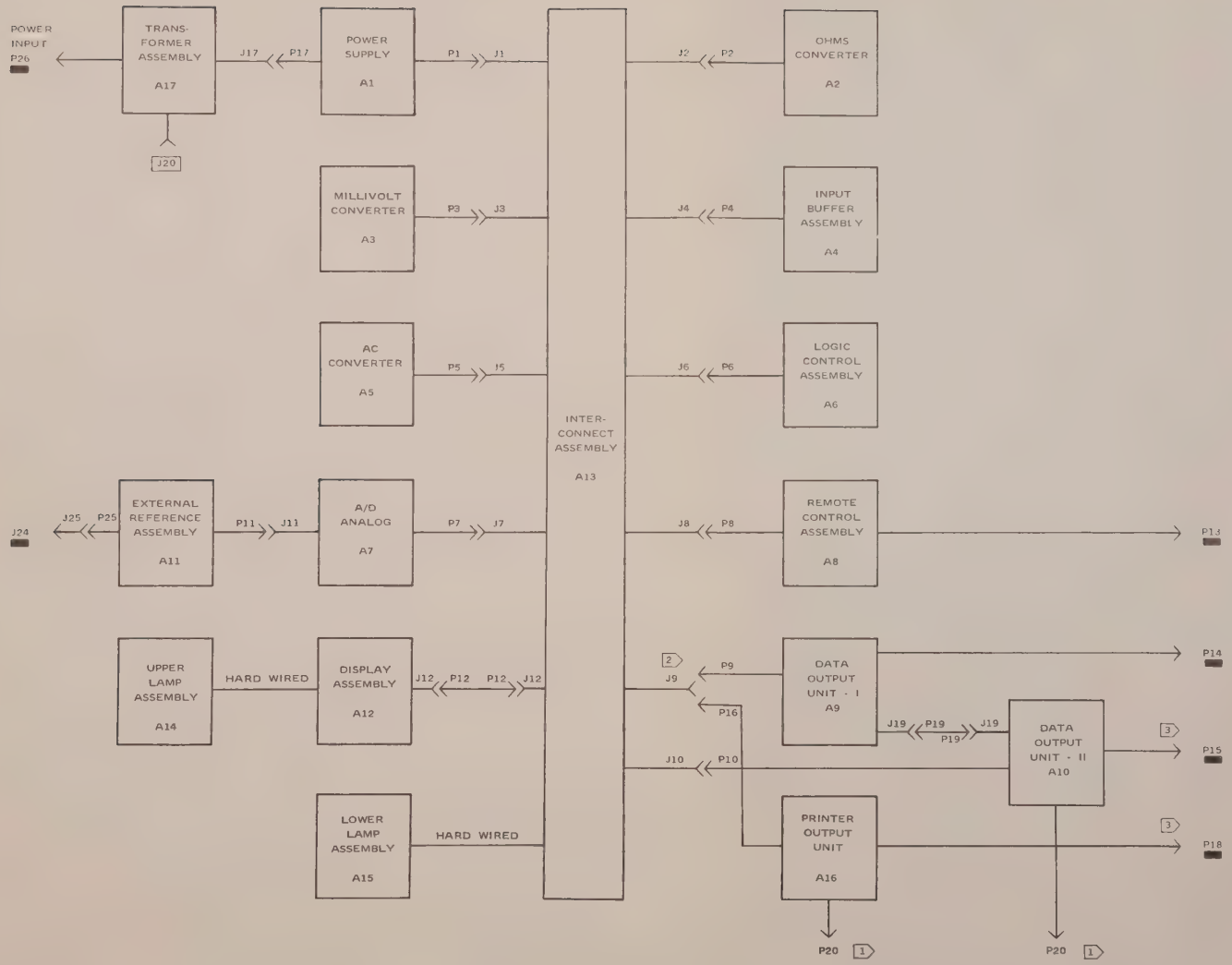
5. (8200A): PLACE THE TWO INSTRUMENTS SIDE BY SIDE. INSERT AN #8-32 SCREW (276477), THROUGH: A WASHER, SHOULDER, INSULATING (295048); BOTH CHASSIS SIDES; ANOTHER WASHER, SHOULDER, INSULATING; AND FASTEN WITH A NUT, ELASTIC STOP (306308), IN EACH OF THE TWO HOLES PROVIDED IN THE CHASSIS SIDE.

(OTHER INSTR.): PLACE THE TWO INSTRUMENTS SIDE BY SIDE. INSERT AN #8-32 SCREW (276477) THROUGH: A WASHER, STEEL (110288); BOTH CHASSIS SIDES; ANOTHER WASHER, STEEL; AND FASTEN WITH A NUT, ELASTIC STOP (306308), IN EITHER ONE OF TWO FRONT MOUNTING HOLES AND THE REAR MOUNTING HOLE.

6. (8200A): POSITION A STIFFENER, RACK SIDE (308262) AGAINST THE SIDE OF THE INSTRUMENT, THEN INSERT TWO #8-32 SCREWS (178376) THROUGH THE RACK EAR (314070), STIFFENER, AND SIDE CHASSIS ENGAGING THE CAPTIVE NUTS. AT THE REAR OF THE CHASSIS SIDE, INSERT A #8-32 SCREW (276477) AND WASHER, SHOULDER, INSULATING (295048) FROM THE INSIDE OF THE INSTRUMENT, THROUGH THE REAR MOUNTING HOLE IN THE CHASSIS SIDE, THEN THROUGH THE STIFFENER AND A WASHER, STEEL, AND FASTEN WITH A NUT, ELASTIC STOP (306308). REPEAT ON OPPOSITE SIDE.

(OTHER INSTR.) POSITION STIFFENER, RACK SIDE (308262) AGAINST THE SIDE OF THE INSTRUMENT, THEN INSERT 2 #8-32 SCREWS (178376) THROUGH THE RACK EAR (314070), STIFFENER, AND SIDE CHASSIS, FASTENING WITH A WASHER, STEEL (110288) AND A NUT, ELASTIC STOP (306308). AT THE REAR OF THE CHASSIS SIDE, INSERT A #8-32 SCREW (276477) AND WASHER, STEEL (110288) FROM THE INSIDE OF THE INSTRUMENT, THROUGH THE REAR MOUNTING HOLE IN THE CHASSIS SIDE, THEN THROUGH THE STIFFENER AND A WASHER, STEEL, AND FASTEN WITH A NUT, ELASTIC STOP (306308). REPEAT ON OPPOSITE SIDE.

7. REPLACE THE TOP AND BOTTOM COVERS.



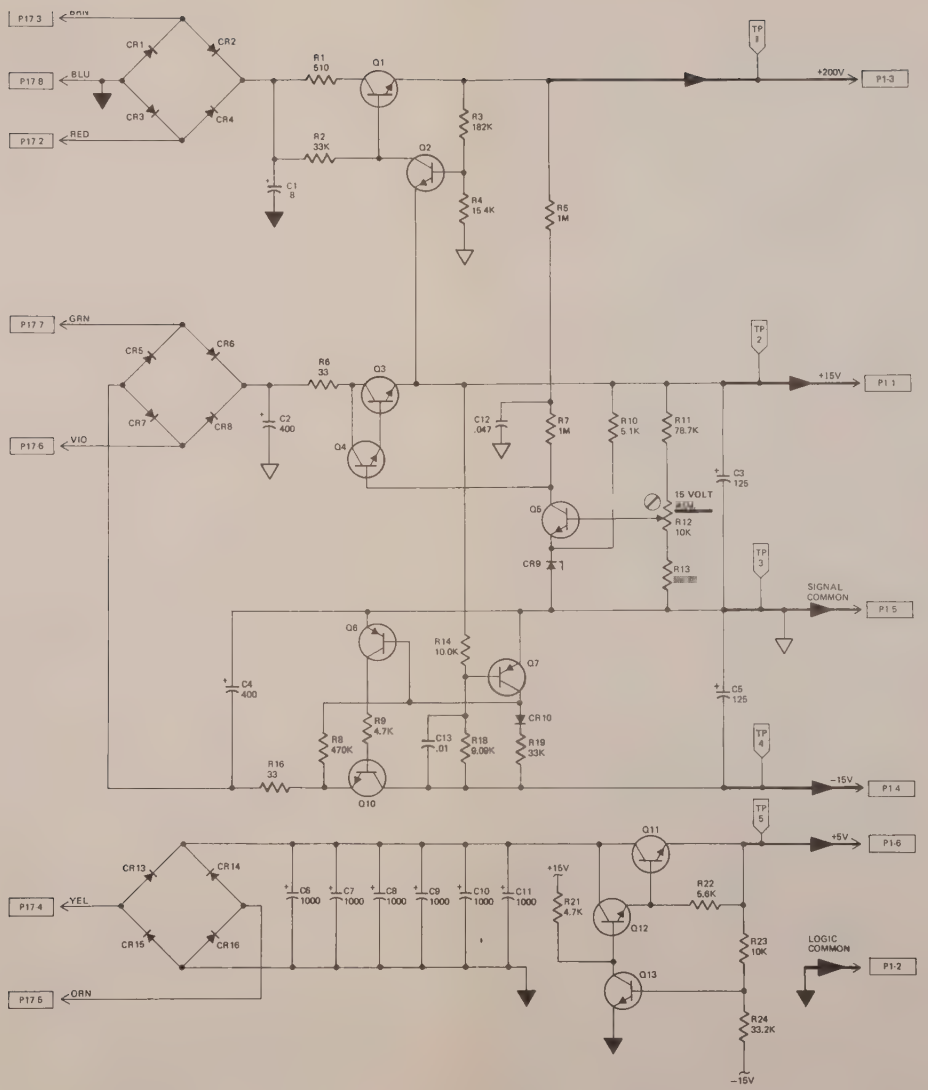
LIST OF SCHEMATICS AND DIAGRAMS

NAME	ASSY NO.	SCHEM. NO.
ASSEMBLY INTERCONNECT DIAGRAM	NONE	1
POWER SUPPLY	A1	2
OHMS CONVERTER	A2	3
MILLIVOLT CONVERTER	A3	4
INPUT BUFFER ASSEMBLY	A4	5
AC CONVERTER	A5	6
LOGIC CONTROL ASSEMBLY	A6	7
A/D ANALOG	A7	8
REMOTE CONTROL ASSEMBLY	A8	9
DATA OUTPUT UNIT — I	A9	10
DATA OUTPUT UNIT — II	A10	11
EXTERNAL REFERENCE ASSEMBLY	A11	12
DISPLAY ASSEMBLY	A12	13
INTERCONNECT ASSEMBLY	A13	14
PRINTER OUTPUT UNIT	A16	15
WIRING DIAGRAM AND INPUT POWER SCHEMATIC	NONE	16

NOTES:

1. ▬ DENOTES REAR PANEL CONNECTOR.
2. [1] MATES WITH A17J20 FOR +5V LOGIC SUPPLY INPUT POWER: CONNECTIONS FOR ONE ASSEMBLY ONLY, EITHER A10 OR A16.
3. [2] EITHER A9P9 OR A16P16 MATES WITH J9, SINCE DOU AND POU OPTIONS ARE MUTUALLY EXCLUSIVE.
4. [3] P18 AND P15 SHARE THE SAME REAR PANEL LOCATION.

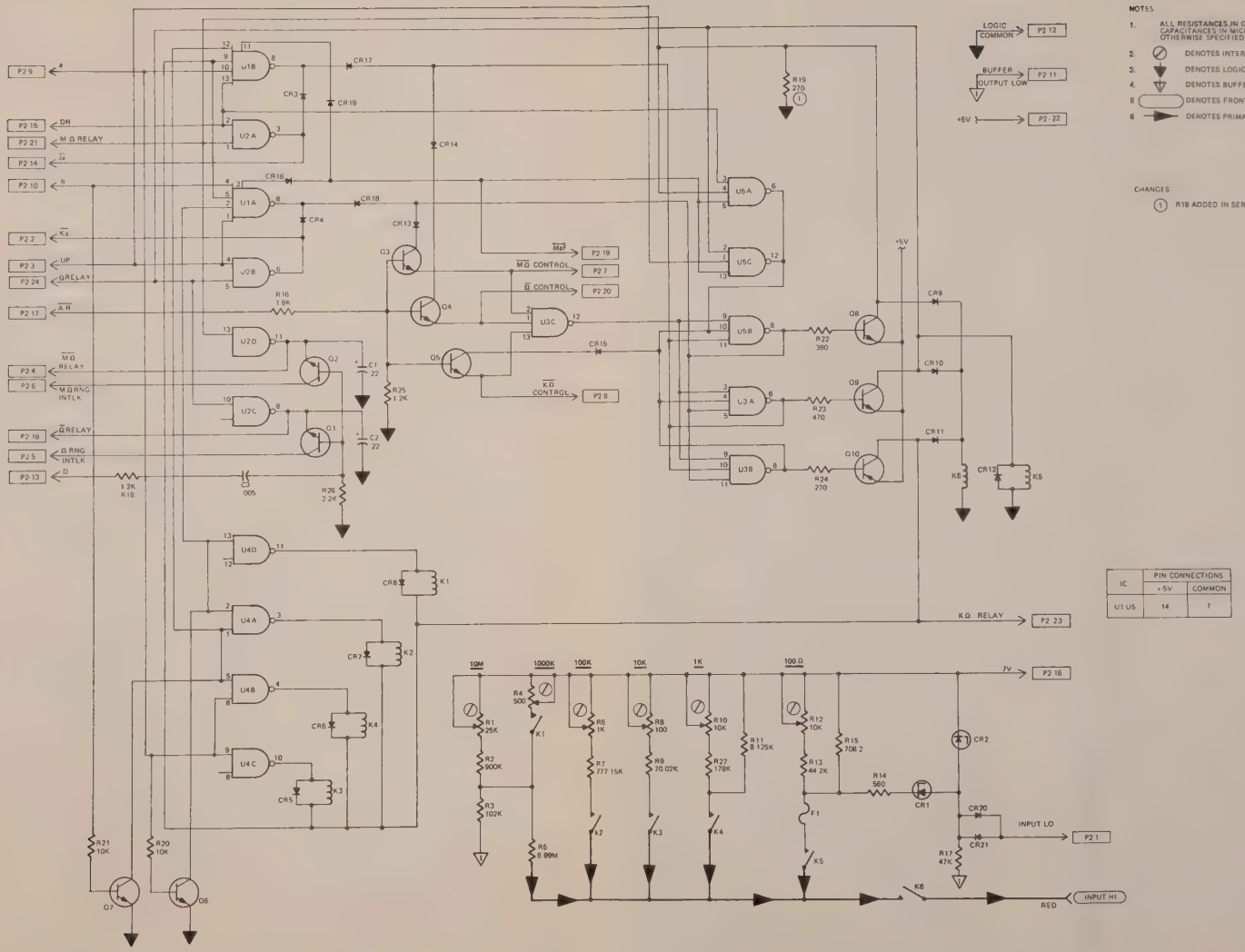
INTERCONNECT DIAGRAM	
ASSEMBLY INTERCONNECT DIAGRAM	1
DRAWING NO. 8200A-1100	REV —
FLUKE JOHN FLUKE MFG. CO., INC. P O Box 7428 Seattle Washington 98133	



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. DENOTES INTERNAL ADJUSTMENT.
3. DENOTES LOGIC COMMON.
4. DENOTES SIGNAL COMMON.
5. DENOTES PRIMARY SIGNAL PATH.

FUNCTIONAL SCHEMATIC DIAGRAM	
A1 POWER SUPPLY	2
Drawing No. 8200A-1001	REV B
FLUKE JOHN FLUKE MFG. CO., INC. P O Box 7428 Seattle, Washington 98133	



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. DENOTES INTERNAL ADJUSTMENT
3. DENOTES LOGIC COMMON
4. DENOTES BUFFER OUTPUT LOW
5. DENOTES FRONT PANEL LOCATION
6. DENOTES PRIMARY SIGNAL PATH

CHANGES

(1) R19 ADDED IN SER. NO. 249 AND ON

IC	PIN CONNECTIONS	
	+5V	COMMON
U1-U5	14	7

FUNCTIONAL SCHEMATIC DIAGRAM

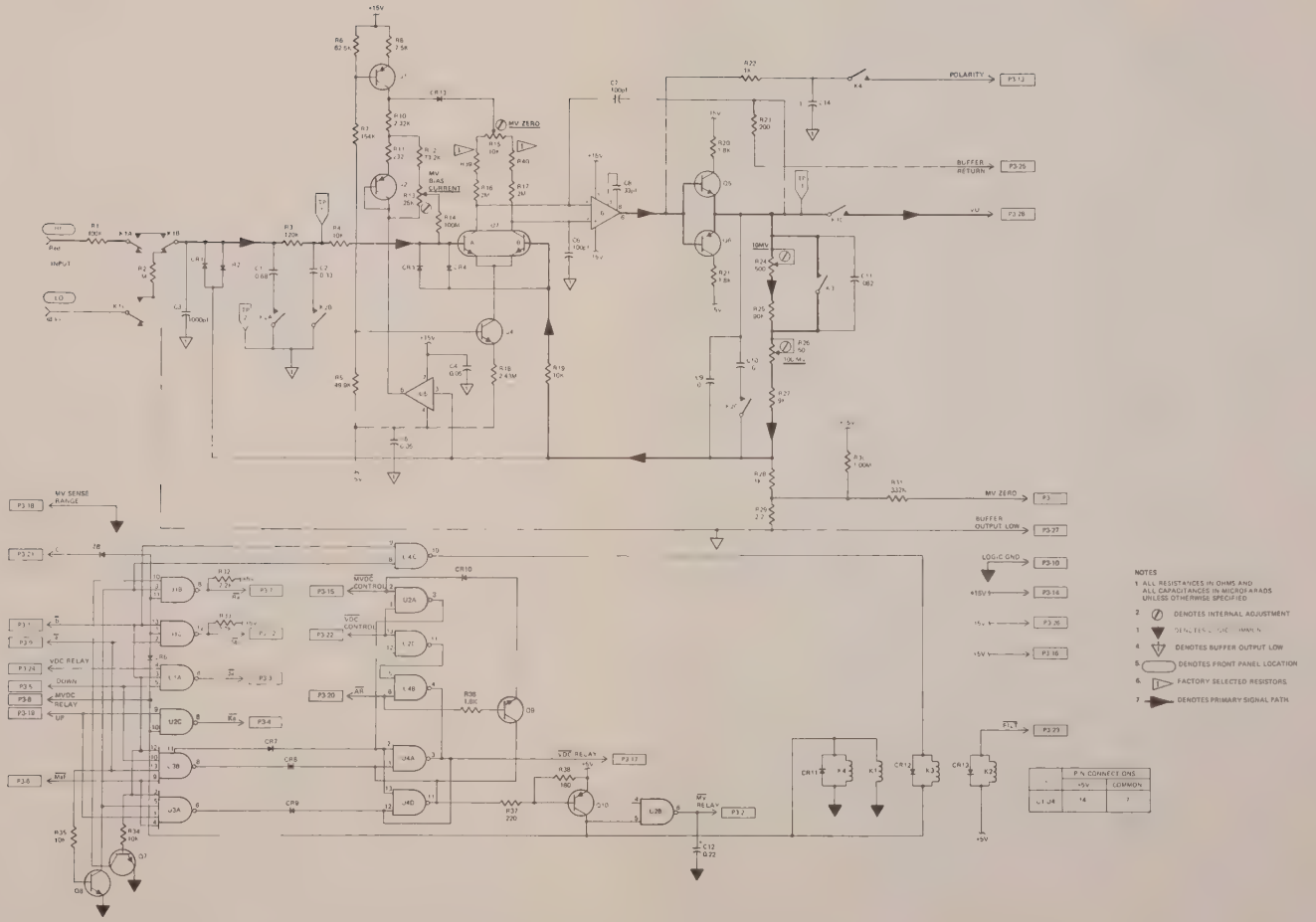
3

A2

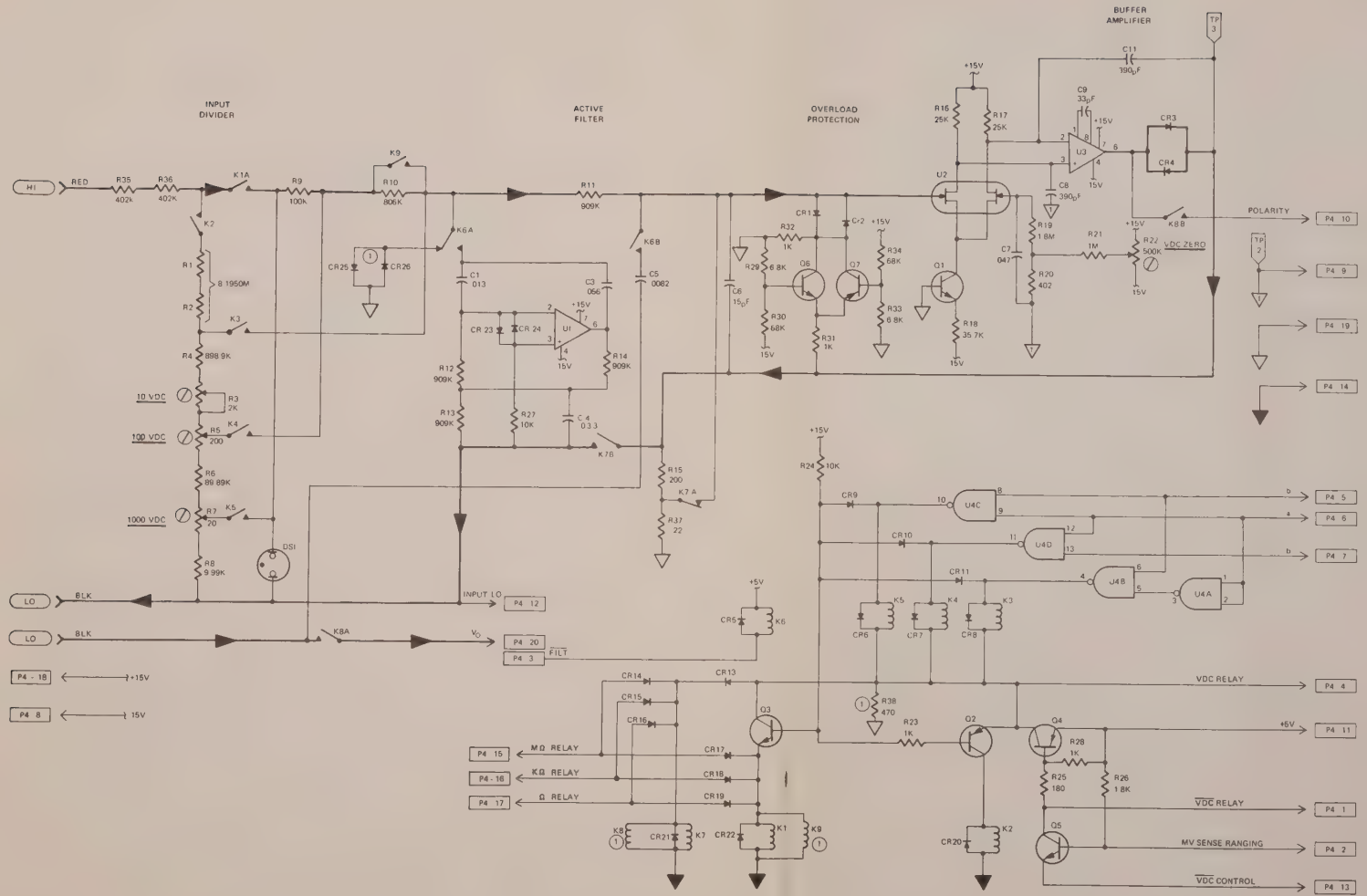
OHMS CONVERTER

Drawing No. 8200A-1002 REV —

FLUKE JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133



FUNCTIONAL SCHEMATIC DIAGRAM	
	4
A3	
MILLIVOLT CONVERTER	
Drawing No. 8200A-1003	REV —
JOHN FLUKE MFG. CO., INC. P.O. Box 7428 Seattle, Washington 98133	



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ⌀ DENOTES INTERNAL ADJUSTMENT.
3. ▽ DENOTES BUFFER RETURN
4. ▽ DENOTES BUFFER OUTPUT LOW
5. ⬭ DENOTES FRONT PANEL LOCATION
6. ▼ DENOTES LOGIC COMMON.
7. → DENOTES PRIMARY SIGNAL PATH.

CHANGES

① R38, CR25, CR26, K8 and K9 added in Ser No 329 and on

IC	PIN CONNECTIONS	
	+5V	COMMON
U4	14	7

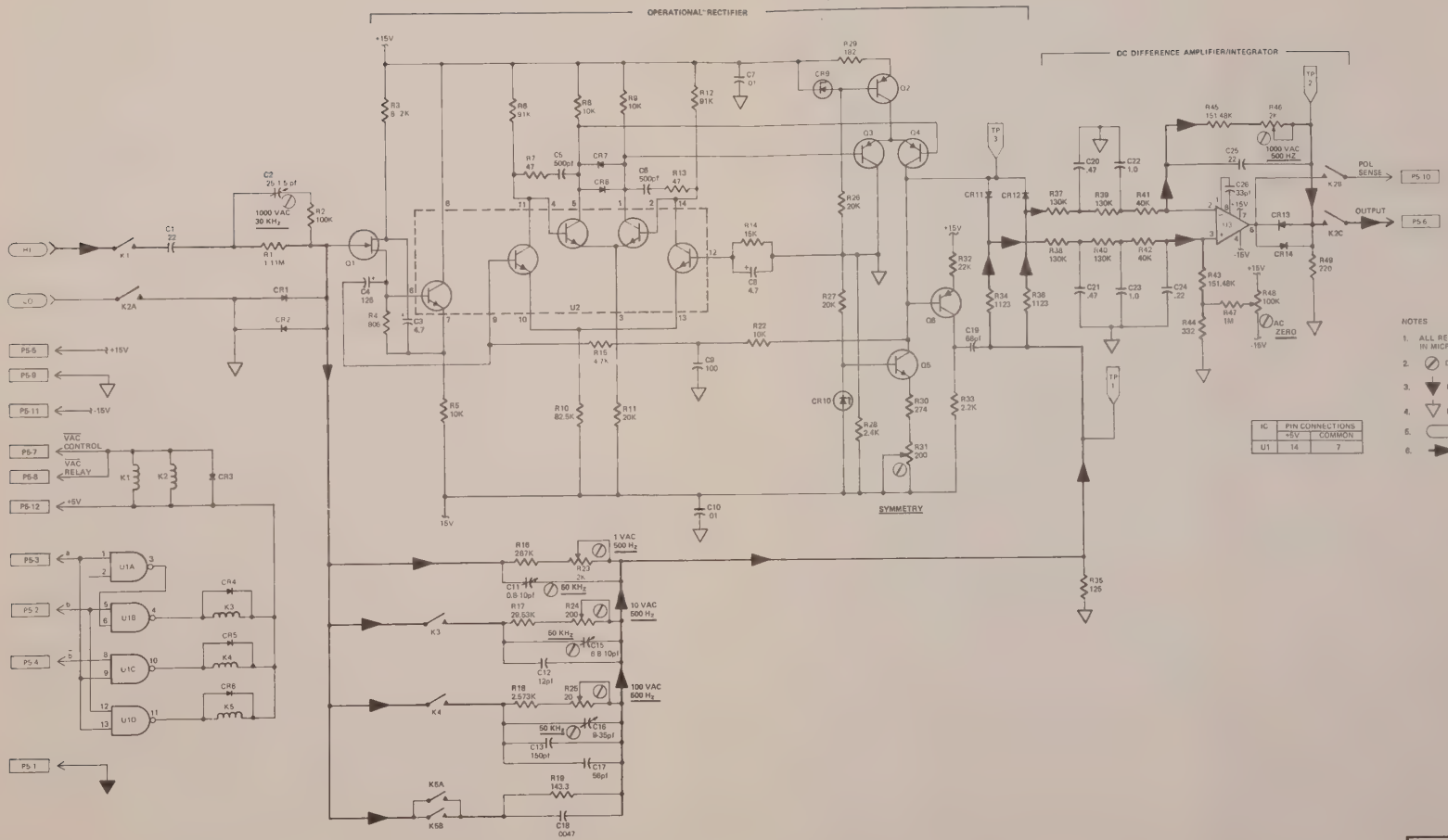
FUNCTIONAL SCHEMATIC DIAGRAM

5

A4
INPUT BUFFER ASSEMBLY

Drawing No. B200A-1004 REV —

FLUKE JOHN FLUKE MFG. CO., INC.
P.O Box 7428 Seattle, Washington 98133



IC	PIN CONNECTIONS	
	+5V	COMMON
U1	14	7

NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ⊘ DENOTES INTERNAL ADJUSTMENT
3. ▼ DENOTES LOGIC COMMON
4. ▽ DENOTES SIGNAL COMMON.
5. ⬭ DENOTES FRONT PANEL LOCATION
6. ▬▶ DENOTES PRIMARY SIGNAL PATH

FUNCTIONAL SCHEMATIC DIAGRAM

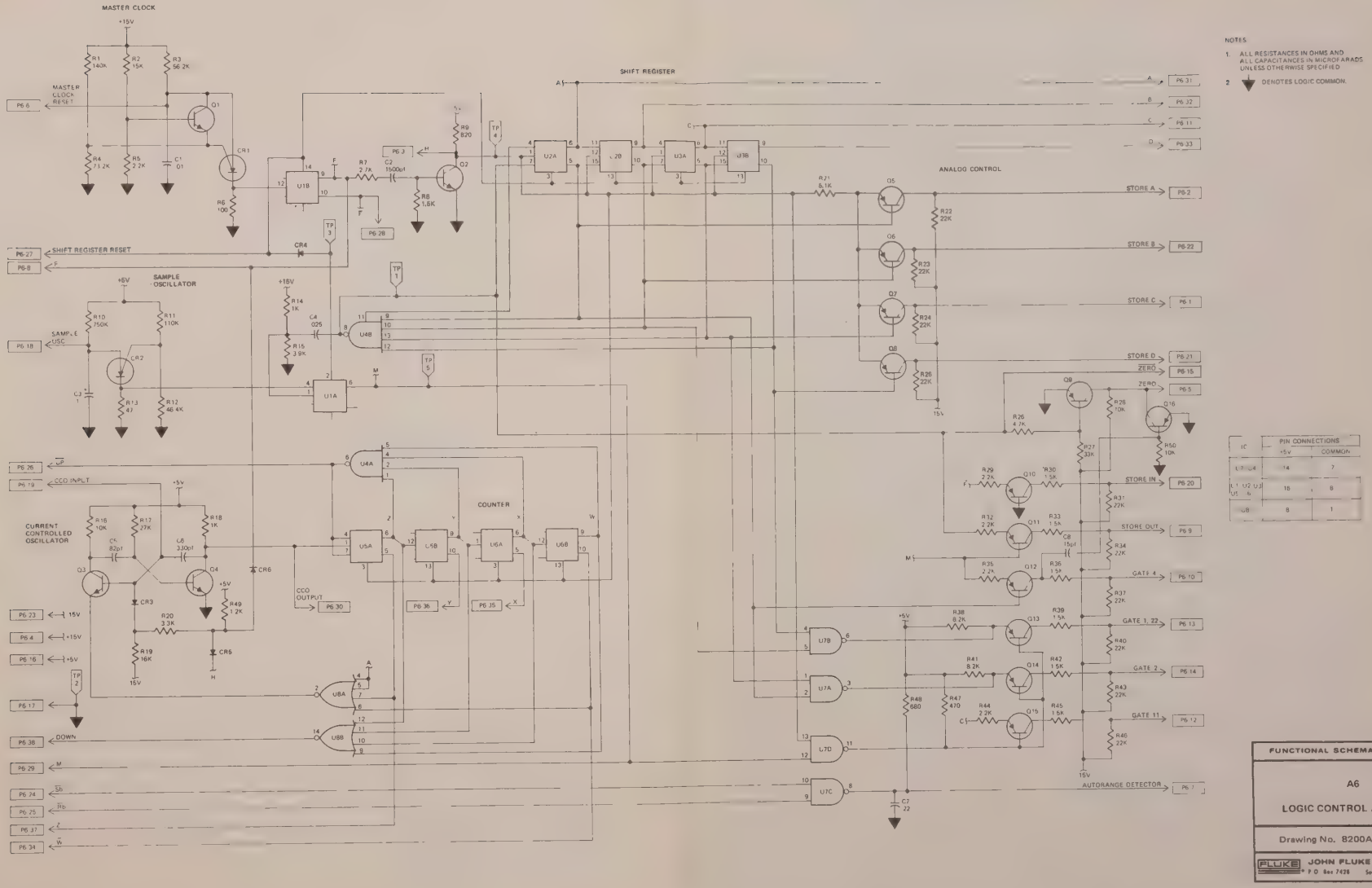
6

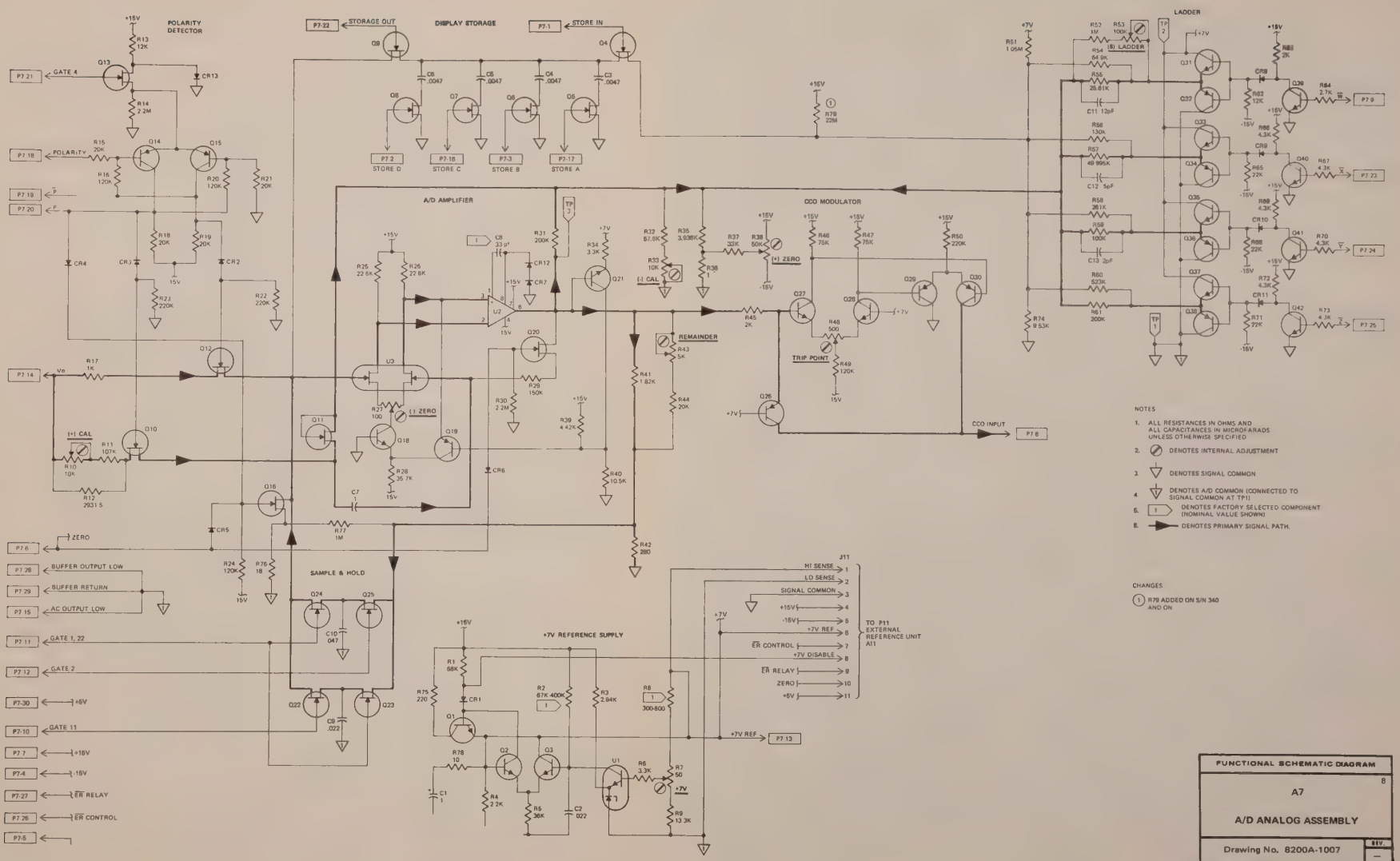
A5

AC CONVERTER

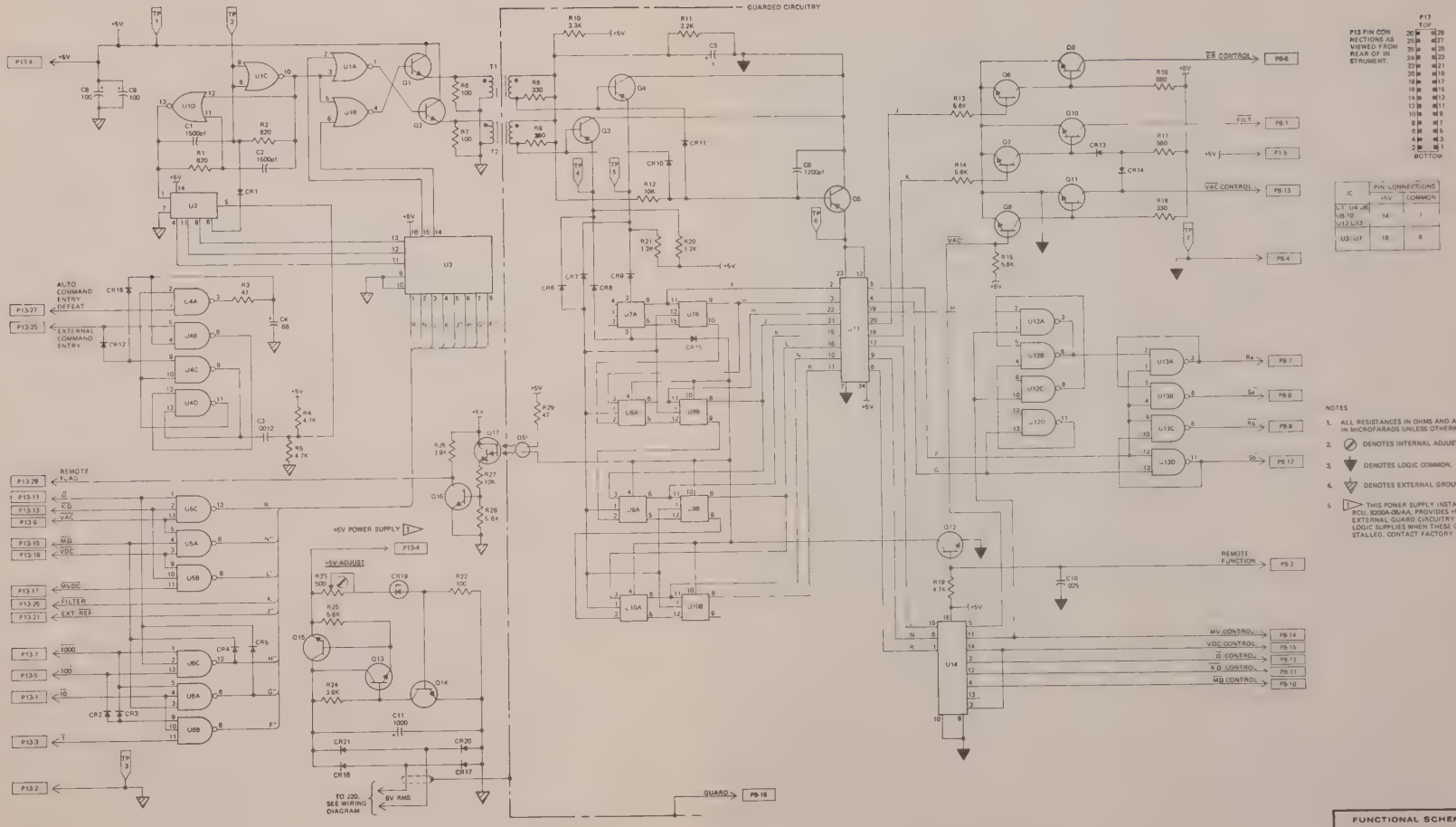
Drawing No. 8200A-1005 REV —

FLUKE JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133


MASTER CLOCK
SHIFT REGISTER
ANALOG CONTROL
SAMPLE OSCILLATOR
CURRENT CONTROLLED OSCILLATOR
COUNTER
SHIFT REGISTER RESET
SAMPLE OSC
CCO INPUT
CCO OUTPUT
STORE A
STORE B
STORE C
STORE D
ZERO
STORE IN
STORE OUT
GATE 4
GATE 1, 22
GATE 2
GATE 11
AUTORANGE DETECTOR
DOWN
NOTES:
1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. DENOTES LOGIC COMMON.
IC | PIN CONNECTIONS +5V | COMMON
U4 | 14 | 7
U1 U2 U3 U5 U6 | 16 | 8
U8 | 8 | 1
FUNCTIONAL SCHEMATIC DIAGRAM
7
A6
LOGIC CONTROL ASSEMBLY
Drawing No. 8200A-1006
REV —
FLUKE
JOHN FLUKE MFG. CO., INC.
P O Box 7428 Seattle, Washington 98133



FUNCTIONAL SCHEMATIC DIAGRAM	
A7	8
A/D ANALOG ASSEMBLY	
Drawing No. 8200A-1007	REV. —
FLUKE JOHN FLUKE MFG. CO., INC. P.O. Box 7428 Seattle, Washington 98133	



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ⊘ DENOTES INTERNAL ADJUSTMENT.
3. ▼ DENOTES LOGIC COMMON.
4. ⏚ DENOTES EXTERNAL GROUND OR COMMON.
5. (1) THIS POWER SUPPLY INSTALLED ONLY IN SPECIAL RCU, 8200A-08AA. PROVIDES +5V LOGIC POWER TO RCU EXTERNAL GUARD CIRCUITRY IN LIEU OF DOU OR POU LOGIC SUPPLIES WHEN THESE OPTIONS ARE NOT INSTALLED. CONTACT FACTORY FOR DETAILS.

FUNCTIONAL SCHEMATIC DIAGRAM

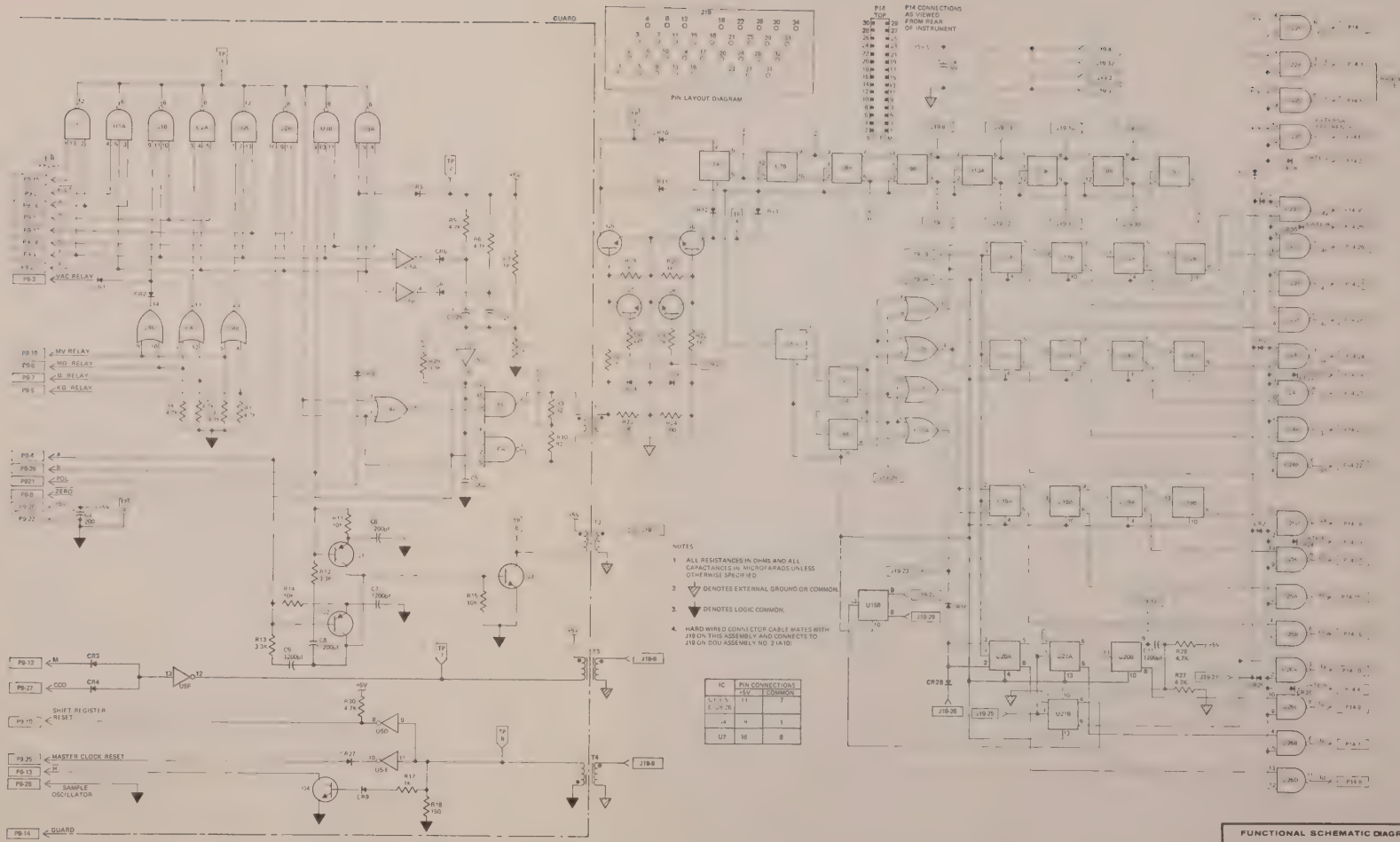
9

A8

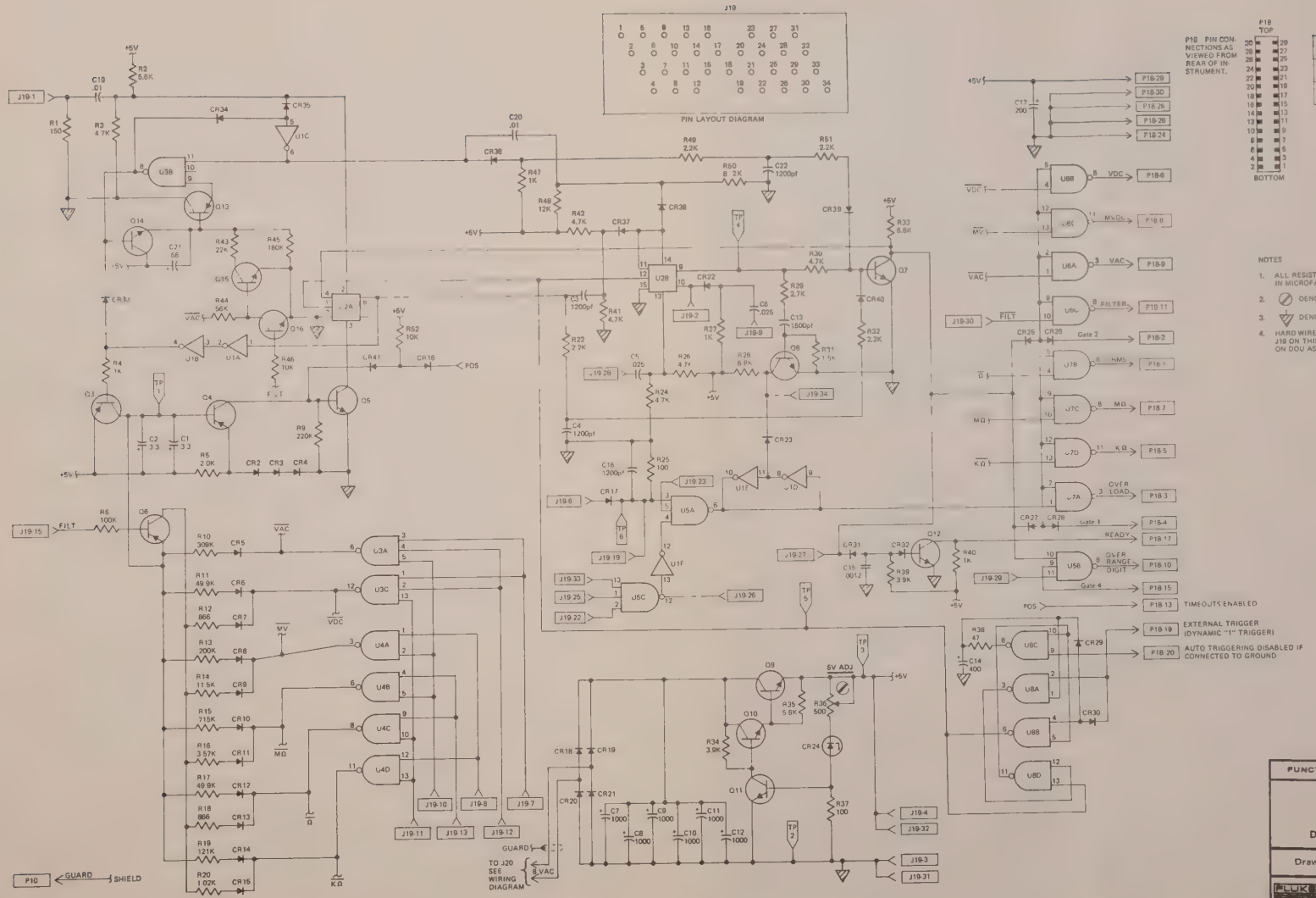
REMOTE CONTROL ASSEMBLY

Drawing No. 8200A-1008 REV —

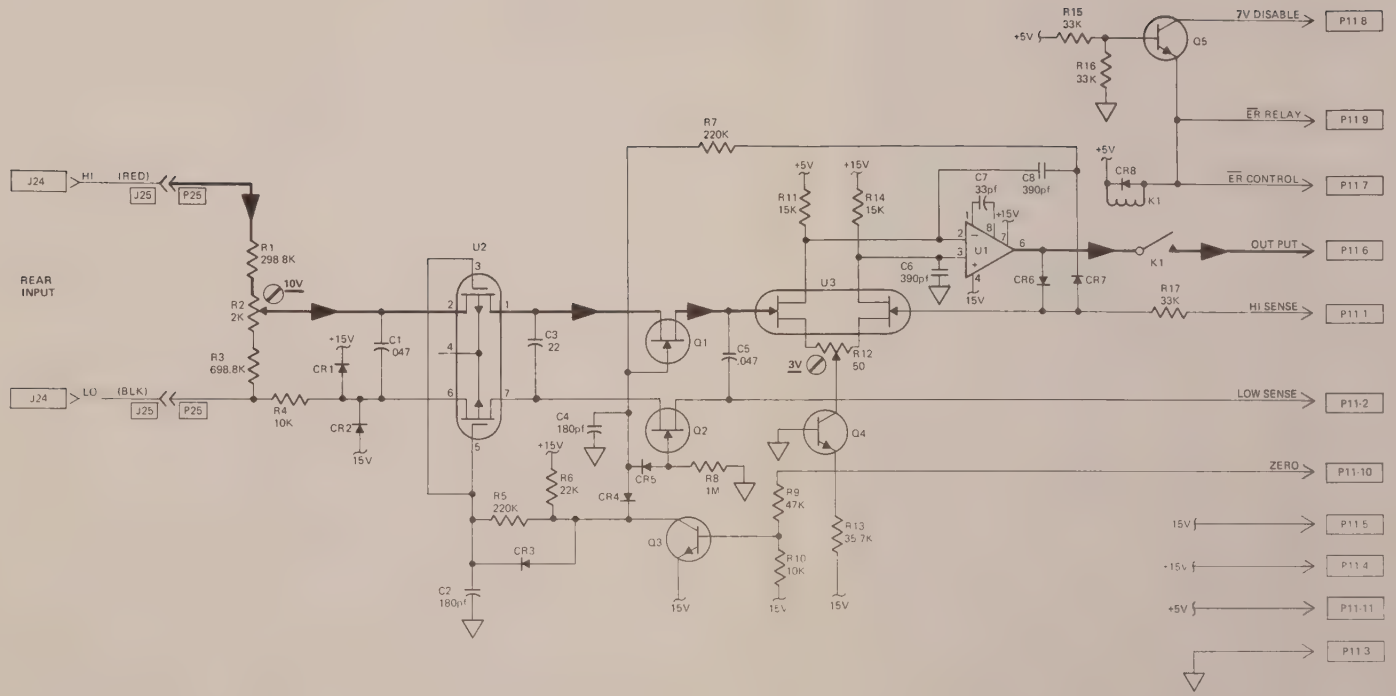
FLUKE JOHN FLUKE MFG. CO., INC.



FUNCTIONAL SCHEMATIC DIAGRAM	
	10
A9	
DATA OUTPUT UNIT–I	
Drawing No. 8200A-1009	REV —
FLUKE JOHN FLUKE MFG. CO., INC. P.O. Box 7428 Seattle, Washington 98133	



FUNCTIONAL SCHEMATIC DIAGRAM	11
A10	
DATA OUTPUT UNIT--II	
Drawing No. 8200A-1010	REV. —
JOHN FLUKE MFG. CO., INC. P.O. Box 7428 Seattle, Washington 98133	



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. DENOTES INTERNAL ADJUSTMENT.
3. DENOTES SIGNAL COMMON.
4. DENOTES PRIMARY SIGNAL PATH.

FUNCTIONAL SCHEMATIC DIAGRAM

12

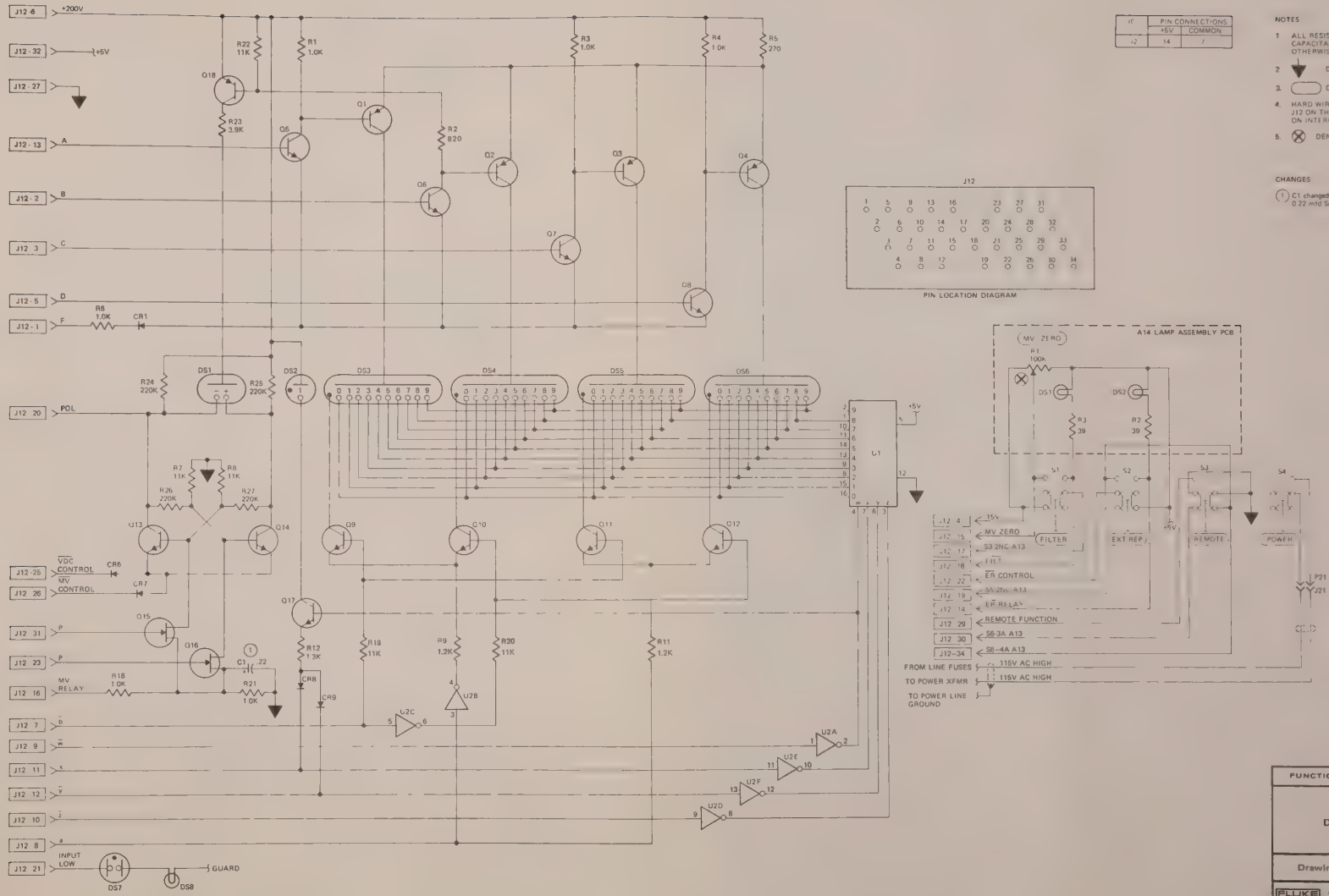
A11

EXTERNAL REFERENCE ASSEMBLY

Drawing No. 8200A-1011

ELV —

FLUKE JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133



IC	PIN CONNECTIONS	
	+5V	COMMON
U2	14	7

NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ▼ DENOTES LOGIC COMMON.
3. ▭ DENOTES FRONT PANEL LOCATION.
4. HARD WIRED CONNECTOR CABLE MATES WITH J12 ON THIS ASSEMBLY AND CONNECTS TO J12 ON INTERCONNECT ASSEMBLY A13
5. ⊗ DENOTES FRONT PANEL ADJUSTMENT

CHANGES

(1) C1 changed from 0.05 mfd to 0.22 mfd Ser No. 249 and on

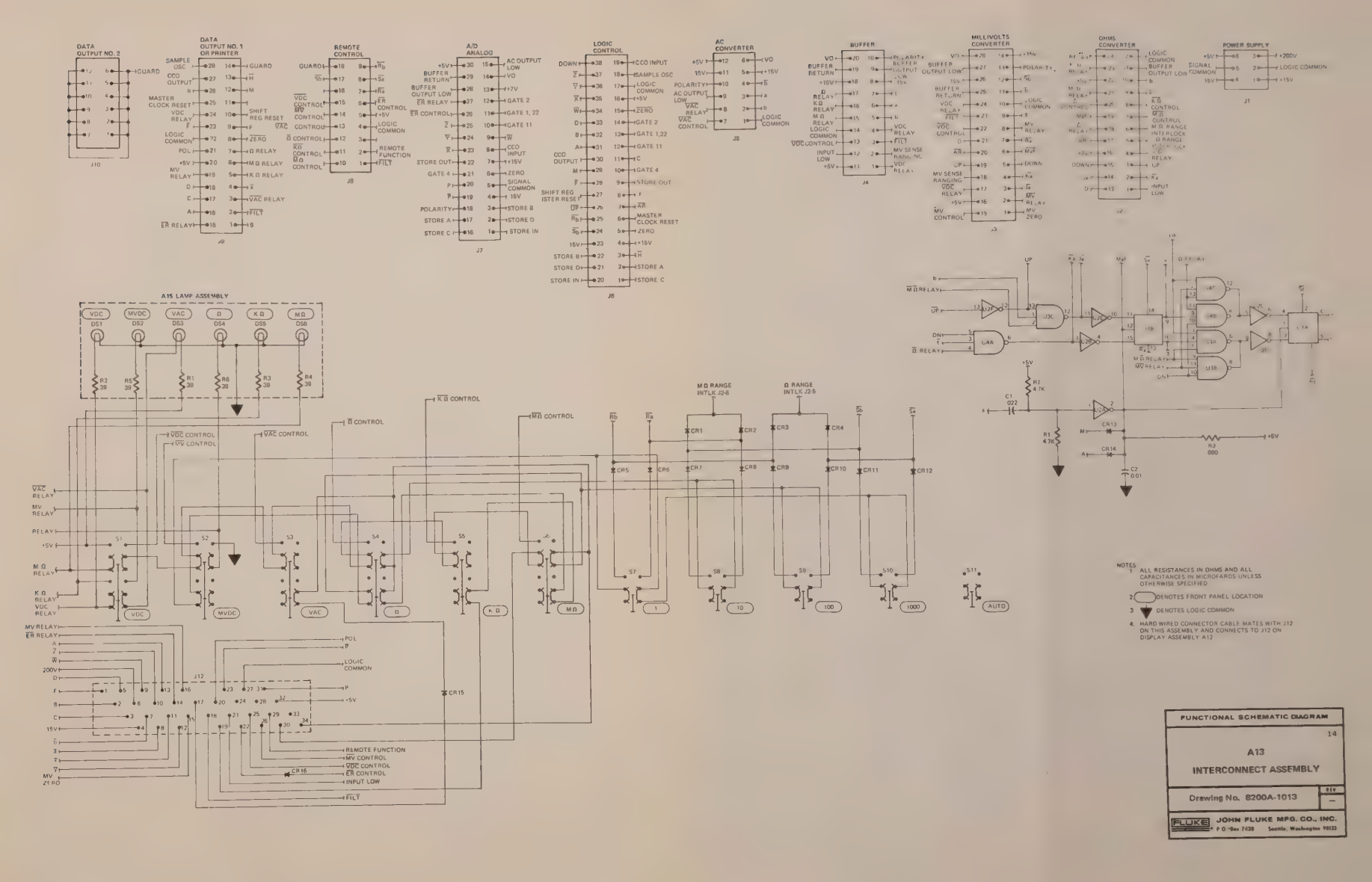
FUNCTIONAL SCHEMATIC DIAGRAM

13

A12
DISPLAY ASSEMBLY

Drawing No. 8200A-1012 REV —

FLUKE JOHN FLUKE MFG. CO., INC.
P.O. Box 7428 Seattle, Washington 98133



NOTES

1. ALL RESISTANCES IN OHMS AND ALL CAPACITANCES IN MICROFARDS UNLESS OTHERWISE SPECIFIED
2. ○ DENOTES FRONT PANEL LOCATION
3. ▼ DENOTES LOGIC COMMON
4. HARD WIRED CONNECTOR CABLE MATES WITH J12 ON THIS ASSEMBLY AND CONNECTS TO J12 ON DISPLAY ASSEMBLY A12

FUNCTIONAL SCHEMATIC DIAGRAM

14

A13

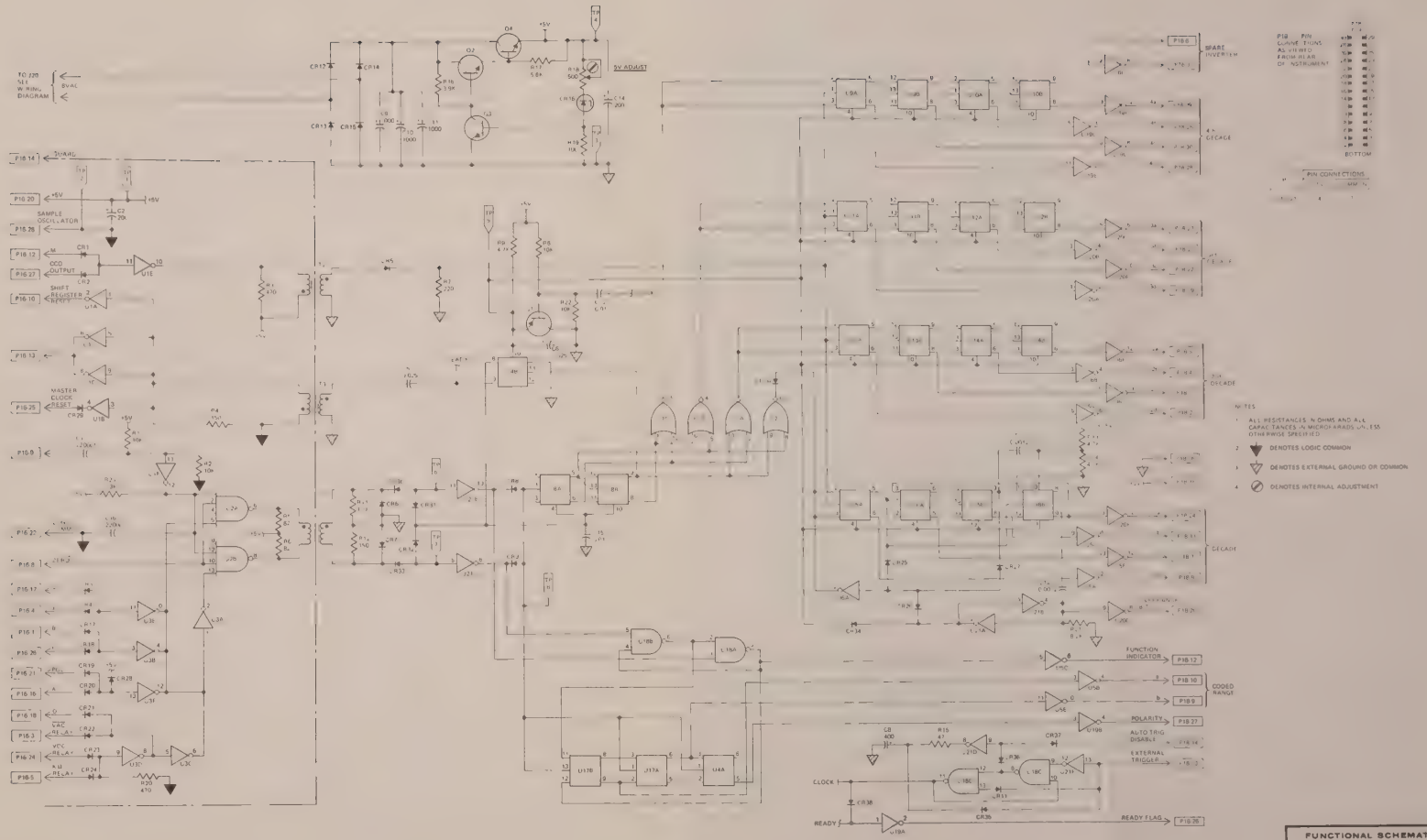
INTERCONNECT ASSEMBLY

Drawing No. 8200A-1013

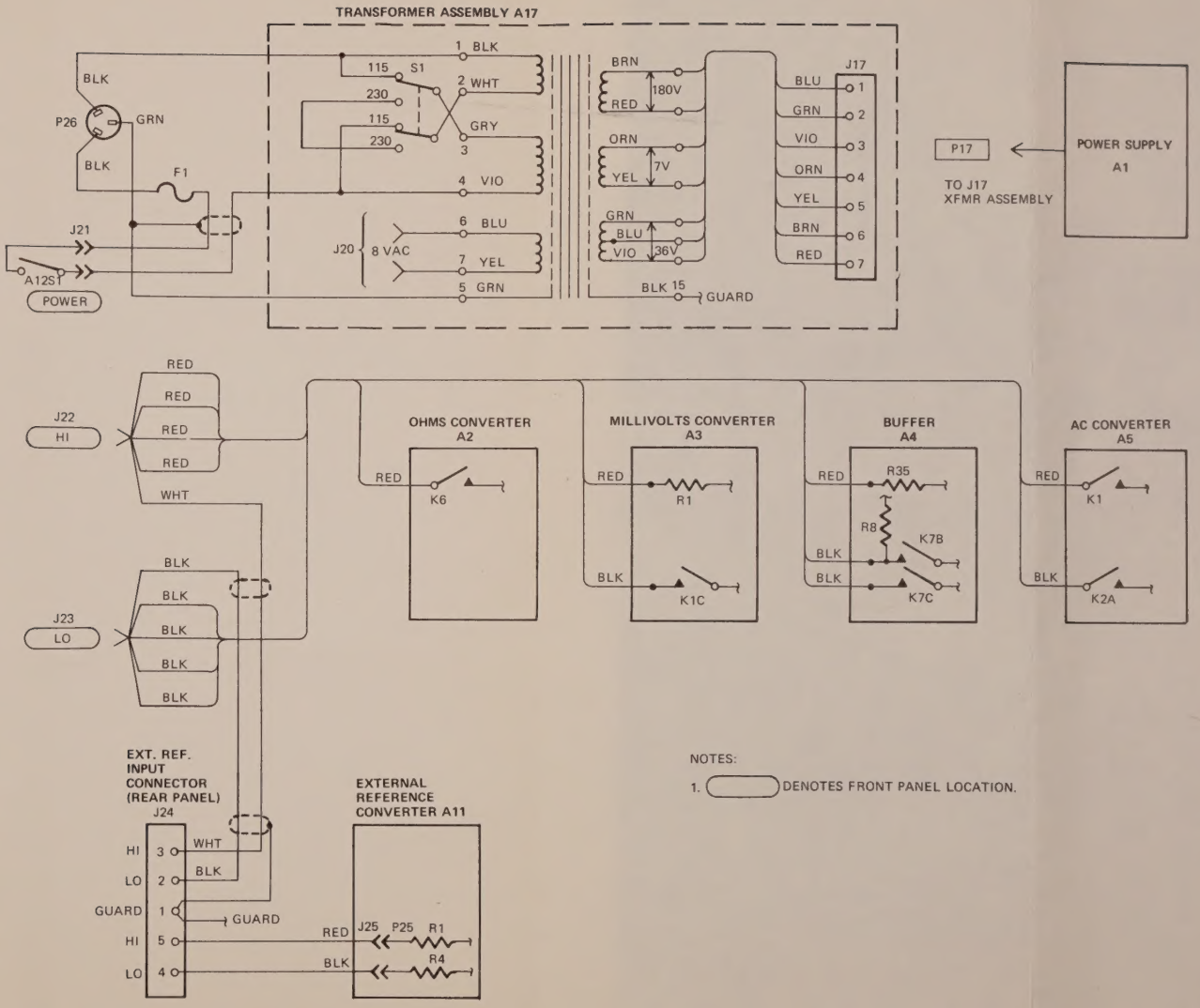
REV —

FLUKE JOHN FLUKE MFG. CO., INC.

P.O. Box 7428 Seattle, Washington 98133



FUNCTIONAL SCHEMATIC DIAGRAM	
	15
A16	
PRINTER OUTPUT UNIT	
Drawing No. 8200A-1016	REV —
FLUKE JOHN FLUKE MFG CO., INC P.O. Box 7428 Seattle, Washington 98133	



NOTES:

1. ( ) DENOTES FRONT PANEL LOCATION.

FUNCTIONAL SCHEMATIC DIAGRAM	
16	
WIRING DIAGRAM AND INPUT POWER SCHEMATIC	
Drawing No. 8200A-1000	REV. —
FLUKE JOHN FLUKE MFG. CO., INC. P.O. Box 7428 Seattle, Washington 98133